METRIC UNITS

10 millimetres (mm.)	= 1 centimetre (cm.)
10 centimetres	= 1 decimetre (dm.)
10 decimetres	= 1 metre (m.)
1,000 metres	= 1 kilometre (km.)

METRIC AND BRITISH CONVERSION TABLE

Linear Measure	
1 kilometre	= 0.6214 mile
1 metre	= 39.37 inches
1 metre	= 3.2808 feet
1 metre	= 1.0936 yards
1 centimetre	= 0.3937 inch
1 millimetre	= 0.0937 inch
1 mile	= 1.609 kilometres
1 yard	= 0.9144 metre
1 foot	= 0.3048 metre
1 inch	= 304.8 millimetres
1 inch	= 2.54 centimetres
1 inch	= 25.4 millimetres

104-03974/

BRITISH COLUMBIA PROVINCIAL MUSEUM
DEPARTMENT OF EDUCATION

HANDBOOK No. 12

The Ferns and Fern-allies
of British Columbia

by

T. M. C. TAYLOR

Department of Biology and Botany
The University of British Columbia

Illustrations by Mary Bryant

VICTORIA, B.C.
Printed by DON MCDIARMID, Printer to the Queen's Most Excellent Majesty
1956

often assigned to it, or are there sufficient reasons for breaking it up into a number of smaller genera, including *Gymnocarpium* and *Thelypteris*? Changes may also be due to a botanist not following the Code so that a correction has to be made. One of the stated purposes of the Code is to aim at fixity of names, and to this end much progress has been made.

The unit in botanical classification is the species. Related species are brought together in a genus; genera in a similar fashion are grouped into families. For certain purposes it is convenient to break up species into smaller populations, such as subspecies, varieties, and forms. For purposes of reference it is obvious that populations in each category must have a name. All (scientific) names are in Latin form, whether they are actually derived from Latin or not. The name of a genus is a noun, e.g., *Asplenium;* that of a species consists of two words, the generic name plus an epithet denoting the species, e.g., *Asplenium viride*. There are technical reasons why it is important to record the name of the author who first gave the name to a species. His name, usually in abbreviated form, follows the specific name, e.g., *Asplenium viride* Huds. If a later author transfers a species from one genus to another, the name of the first author is placed in parentheses followed by the name of the second author, e.g., *Dryopteris filix-mas* (L.) Schott. The male fern was first named by Linnæus as *Polypodium filix-mas* but was later transferred to the genus *Dryopteris* by Schott.

Subdivisions of a species are designated by appropriate abbreviations; those used most commonly are "ssp." (subspecies), "var." (variety), and "f." (form). The rule for including authors' names still applies, with one exception. The typical subspecies, variety, or form is indicated by its epithet repeating the specific epithet unchanged and not followed by an author's name, e.g., *Cystopteris fragilis* (L.) Bernh. var. *fragilis*.

In the accounts of the species that follow, the author can claim little originality. Ample descriptions of all our species are available in a number of excellent works. These have been drawn on freely to supplement careful study of specimens at hand. Particular reference has been made to Abrams, *Illustrated Flora of the Pacific States,* Vol. 1, 1923, in which the "Pteridophyta" were contributed

by the late Dr. W. R. Maxon; Gleason, *New Britton and Brown Illustrated Flora*, Vol. 1, 1952, with the "Pteridophyta" by Conrad V. Morton; and Fernald, *Gray's Manual of Botany*, 8th ed., 1950. Also of assistance were Henry, *Flora of Southern British Columbia*, 1915; Peck, *Manual of the Higher Plants of Oregon*, 1941; and Frye, *Ferns of the Northwest*, 1934. The general format was inspired by Wherry, *Guide to Eastern Ferns*, 1948. Particular mention should be made of the pen-and-ink drawings that have been prepared for this volume; all are the skilful work of Mrs. Mary Bryant. The author is particularly indebted to her, not only for her painstaking attention to detail in the preparation of the drawings, but also for her capable assistance in checking the manuscript. The writer also wishes to express his indebtedness to the Director and staff of the Brooklyn Botanical Gardens for assistance and kindnesses shown to him when he held the Stuart Gager Memorial Fellowship at that institution. Much of the necessary preliminary work required for this book was made possible by this fellowship. The specimens from British Columbia in most of the larger herbaria in North America have been examined by the writer; grateful acknowledgment is made to their curators for many courtesies extended.

It will be noted that an alphabetical sequence has been followed throughout. This will offend the sensibilities of some who feel that the arrangement in such a work as this should indicate relationship. This argument is open to many objections. The modern view has very largely dispensed with the concept of a tree-like relationship in favour of a network-like pattern of descent. Neither of these concepts can even be suggested by the sequence in which families, genera, and species are arranged. Such considerations lie in the realm of botanical philosophers and should not impair the practical usefulness of a handbook such as this.

BRITISH COLUMBIA PROVINCIAL MUSEUM
DEPARTMENT OF EDUCATION

LIBRARY
WITHDRAWN

HANDBOOK No. 12

The Ferns
and
Fern-allies
of British Columbia

By
T. M. C. TAYLOR
Department of Botany and Botany
The University of British Columbia
Vancouver, B.C.

VICTORIA, B.C. JUNE, 1956

TABLE OF CONTENTS

	Page
Introduction	5
Key to Families	10
Equisetaceæ—Horsetail Family	11
Isoëtaceæ—Quillwort Family	30
Lycopodiacea—Club-moss Family	32
Marsileaceæ—Pepperwort Family	48
Ophioglossaceæ—Adder's-tongue Family	50
Polypodiaceæ—Polypody Fern Family	61
Salviniaceæ—Water-fern Family	138
Selaginellaceæ—Spikemoss Family	140
Doubtful or Excluded Species	146
Glossary	147
Index to Common Names and Synonyms	153

THE FERNS AND FERN-ALLIES OF BRITISH COLUMBIA

INTRODUCTION

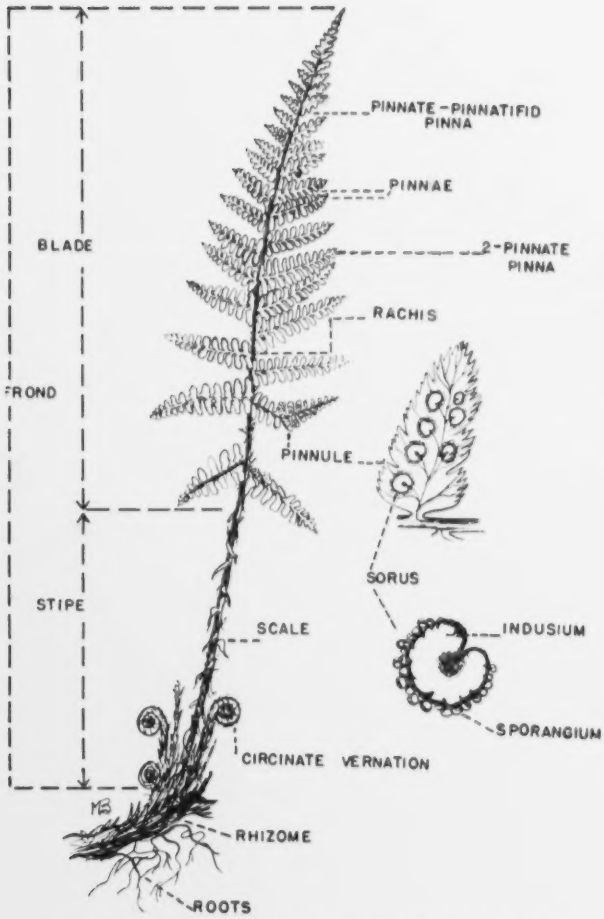
Of recent years there has been an increasing demand for some popular account of the ferns and fern-allies of British Columbia. The present handbook has been prepared in part to meet this need and in part in the hope of stimulating interest in this attractive group of plants. Ferns and their allies lend themselves very well as objects for study by naturalists and other non-professional botanists. Their numbers are not great, about seventy species being known to occur in the Province. With the exception of the quillworts (Isoëtes), their diagnostic features require the use of only a magnifying glass of quite low power and most species can be identified with little trouble. Another advantage of the group is that some members at least can be found throughout the Province and so no geographical limitation is placed on their study.

The ferns and fern-allies are placed by botanists in the class Pteridophyta. In a sense they are intermediate between the simplicity of the mosses and liverworts on the one hand, and the complexity of the seed plants on the other. They are made up of true roots, stems, and leaves, with many of the features found in the seed plants. Reproduction, however, is by spores and not by seeds. The differences between these two reproductive structures are technical and involved and need not concern us here. The important point is that a spore contains no embryo and grows directly into the sexual or gametophyte generation. While the gametophyte stage differs with each family of the pteridophytes, its study is difficult and not helpful from the point of view of identifying species. No further reference to gametophytes will be made. It is on the obvious spore-producing generation that our attention will be focused. This stage is the fern plant as we know it. Since it reproduces by spores, it is appropriately termed the sporophyte generation.

Each science, in fact each subdivision of a science, has its own vocabulary of technical, descriptive words and phrases. In this regard the Pteridophyta are no exception and so, as an aid to the reader, a glossary has been included. It is hoped that here will be found any technical word that may be puzzling to the layman. Two prefixes used quite frequently should have special mention: "sub," as a prefix to many adjectives, indicates "more or less" or "somewhat," e.g., subopposite, more or less opposite; "ob" indicates inversion and is usually employed with adjectives of shape, e.g., oblanceolate, lanceolate with the broadest part above the middle. The joining of two adjectives by a hyphen signifies an intermediate condition between the two, e.g., triangular-ovate, linear-oblong, etc.

Something should be said about the naming of plants. It is here that the layman is most likely to become bewildered and exasperated. The value of any name lies in being able to apply it to a specific thing as a means of reference. Within a very limited geographical area a so-called "common name" may have this value, but such value will disappear as soon as one gets into a new language or cultural group. Thus it is that we find that the same kind of plant may have literally dozens of common names in different parts of its range. Conversely, we often find that the same common name is applied, in different parts of the world, to quite different plants. It is apparent, therefore, that a common name has very little value when one wishes to refer with precision to a particular kind of plant.

Botanists the world over voluntarily accept an international code as a basis for the proper naming of plants. If this be so, "Why," the layman asks, "are technical names constantly being changed?" The answer lies in the fact that the International Code does not lay down any rules by which one should decide if two plants belong to the same species or to two different species. This decision is entirely a matter of judgment on the part of the botanist concerned and hence different opinions must be expected. Once a decision has been made, the International Code lays down the rules that must be followed in naming the plant. Changes in names are generally due to such differences of opinion; e.g., should the genus *Dryopteris* be maintained to include the scores of species



Named drawing to show morphological details of a fern.

KEY TO FAMILIES

a. Leaves small, narrow, scale-like or linear-subulate; plants resembling mosses or rushes.
  b. Stem conspicuously jointed and ridged lengthwise ..... EQUISETACEÆ
  bb. Stems not obviously jointed and ridged lengthwise.
    c. Leaves long, quill-like, arising in a rosette, enlarged at base to contain spores; stem short and thick, corm-like ..... ISOËTACEÆ
    cc. Leaves short, blade expanded, scattered along the stem; stem somewhat elongated, not corm-like.
      d. Plants very small, moss-like, floating on water; leaves in a single plane ..... SALVINIACEÆ
      dd. Plants relatively large, more than 3 cm. long, terrestrial; leaves in 2 or more planes.
        Stems extensively creeping; branches erect or, if tufted, branching dichotomous; strobili terete, often conspicuous, homosporous ..... LYCOPODIACEÆ
        Stem short-creeping tending to form mats; branches prostrate, not dichotomously branched; strobili usually 4-sided and inconspicuous, heterosporous ..... SELAGINELLACEÆ
aa. Leaves large, more than 2 cm. long, part at least expanded into a blade, not quill-like.
  b. Leaves 4-foliate, petioles long; sporangia in ovoid sporocarps borne in pairs on short stalks at base of vegetative leaves; aquatic plants ..... MARSILEACEÆ
  bb. Plants otherwise.
    Sporangia borne on specialized branch arising from base of lateral, leafy segment; single shoot arising from rhizome each year ..... OPHIOGLOSSACEÆ
    Sporangia borne on the back of but slightly modified vegetative fronds or inside tube-like or berry-like segments; usually a number of shoots arising from the rhizome each year ..... POLYPODIACEÆ

EQUISETACEÆ—HORSETAIL FAMILY

Perennial herbs. Rhizomes deeply subterranean, branched, widely spreading, dark-coloured, jointed with the nodes marked by toothed sheaths, aerial stems arising at intervals. Stems, either all alike and green or of two kinds with the fertile lacking chlorophyll, usually erect, simple or branched, cylindrical, grooved, internodes with a large central cavity (except with us in *E. scirpoides*) and a ring of smaller vallecular cavities in the cortex, prominently ridged between the grooves with siliceous tubercles or bands; stomata conspicuous, sunken in bands or in regular rows. Leaves very small, scale-like, in whorls of 3 or more at a node, fused laterally to form a sheath, usually dark-coloured and not green, with free, sometimes deciduous, tips, usually of the same number as the grooves of the stem. Branches, if present, in whorls, growing out through the nodal-sheath; branch-sheaths much smaller and with fewer teeth. Sporangia typically borne in terminal cones, in some species at the tips of vegetative growth, in others on specialized reproductive stems that lack chlorophyll; cones apiculate or obtuse, made up of whorled, peltate sporophylls with flat polygonal tips; spores greenish, each provided with four hygroscopic bands with widened tips (elaters).

The family contains a single, almost cosmopolitan, genus of about 20 species. (Named from the Latin *equus* (horse) and *seta* (bristle).)

EQUISETUM L. HORSETAIL, SCOURING-RUSH

Characters those of the family.

a. Cones long-peduncled, rounded at the top; stems annual, sterile stems as a rule with regularly whorled branches.

b. Fertile and sterile stems not alike; first internode of the primary branches considerably longer than the stem-sheath; coning in spring.

c. Coning stem somewhat fleshy, whitish or in shades of pink and brown, soon withering, usually unbranched; branches on sterile stems usually not again branched, teeth of branch-sheaths triangular-lanceolate or narrower.

Fertile stems 5–25 cm. tall, stem-sheaths with 8–12 teeth; cones 2–3 cm. long; sterile stems up to 60 cm. tall, 6–14 furrowed, branches 3- or 4-angled ..... *E. arvense*

Fertile stems 30–60 cm. tall, stem-sheaths with 20–30 teeth; cones 4–8 cm. long; sterile stems 0.5–3.0 m. tall, 20–40 furrowed; branches 4–6-angled ..... *E. telmateia*

cc. Coning stems becoming green and branched, persistent, although cones and tips of stems soon wither; branches on sterile stems rebranched, but if not so, teeth of branch sheaths deltoid.

Stem-sheaths chestnut brown, flaring upwards, teeth cohering in several broad lobes; branches usually rebranched ..... *E. sylvaticum*

Stem-sheaths green, rather tight, teeth white-margined, free or nearly so; branches usually unbranched ..... *E. pratense*

bb. Fertile and sterile stems similar, green; first internode of the primary branches equalling or mostly shorter than the stem-sheath, or the stem unbranched; coning in summer.

Central cavity of main stem small, about one-sixth the diameter of the stem; vallecular cavities nearly as large; stem-sheaths mostly 10–14 mm. long, loose, expanding upwards, with 10, usually white-margined, teeth ..... *E. palustre*

Central cavity larger, one-half to four-fifths the diameter of the main stem; vallecular cavities much smaller or wanting; stem-sheaths 5–10 mm. long, scarcely white-margined ..... *E. fluviatile*

aa. Cones short-peduncled, the peduncle not, or only slightly exceeding the subtending sheath, apiculate; stems evergreen (except *E. lævigatum*), usually unbranched or at least without regular whorls of branches.

b. Stems lacking a central cavity; vallecular cavities usually 3; stems low and flexuous ..... *E. scirpoides*

bb. Stems with a central cavity; vallecular cavities 5 or more.

c. Stems 5–10- (rarely 12-) ridged, the ridges sulcate and bearing 2 rows of tubercles; teeth of stem-sheaths persistent *E. variegatum*

cc. Stems normally 14–40-ridged, the ridges rounded with a single row of tubercles or cross-bands.

Sheaths longer than broad, widened upwards with a single dark band above; stems smoothish, mostly annual *E. lævigatum*

Sheaths nearly or quite as broad as long, nearly cylindrical, tight, mostly ashy at maturity with 2 dark bands; stems rough, evergreen ..... *E. hiemale*

Equisetum arvense L. Common Horsetail

Rhizome felted, bearing ovoid tubers. Stems annual, up to 75 cm. tall, of two kinds. Sterile stems solitary or clustered, erect or decumbent, the central cavity about one-half the diameter of the stem, vallecular cavities large. Sheaths 5.0–10.0 mm. long, gradually widened upwards, green; teeth as many as the grooves, 1.5–2.0 mm. long, triangular-lanceolate to lance-attenuate, persistent, scarious-margined, less than one-fourth the length of the tube. Branches solid, numerous, spreading, regularly whorled, 3- or 4-angled, branch-sheath 3- or 4-toothed; first internode longer than the subtending stem-sheath. Fertile stems flesh-coloured to brown, stout, up to 25 cm. tall and 8 mm. thick, unbranched, appearing before the sterile stems but soon withering. Sheaths 14–25 mm. long, pale brown, teeth 6–12, darker, 5–9 mm. long, lanceolate, partly connate. Cone obtuse, long-peduncled.

Habitat.—Very tolerant of soil conditions, usually growing in full sun or part shade; often invades railway embankments or roadsides.

Range.—Cosmopolitan throughout the northern parts of the Northern Hemisphere.

Comments.—Common throughout. A very variable species with numerous forms that apparently result from differences in the environment. Sterile shoots are likely to be confused with those of *E. pratense* but usually can be distinguished by the teeth of the branch-sheath. In *E. arvense* these are narrowly triangular-lanceolate, gradually tapering to a long point.

Equisetum fluviatile L. Swamp Horsetail

Rhizomes glabrous, shining, reddish, widely creeping, rarely tuber bearing. Stems annual, all alike, erect, mostly solitary, up to 1 m. tall, 3–8 mm. thick, shallowly ridged; ridges smooth not spinulose, grooves 10–30, fine. Central cavity at least four-fifths the diameter of the stem; vallecular cavities absent except near the base. Sheaths subcylindrical, mostly tight-appressed or the upper somewhat widened upwards; teeth persistent, free, not

Equisetum arvense L. Common horsetail.

ribbed, lanceolate, acuminate, dark brown, scarcely scarious margined. Branching very varied from none to many, mostly near the middle of the stem, branches themselves unbranched, branch-sheaths with 4-6 teeth, the basal dark brown, the first internode slightly shorter than the stem-sheath. Cones borne at the tip of the main stem, obtuse, long-stalked, deciduous. (*E. limosum* L.)

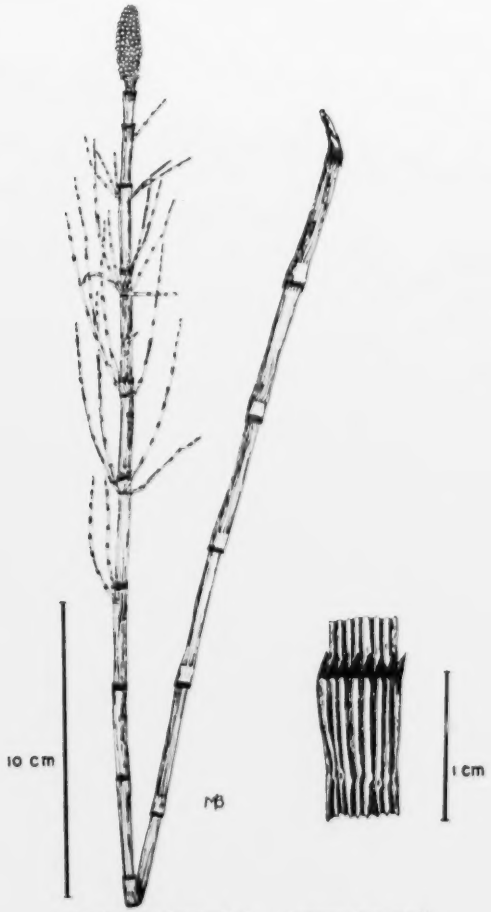
Habitat.—Shallow water at the edge of lakes, ponds, and ditches, or marshy places.

Range.—Alaska to Nfld., s. to Ore., Wyo., Neb., Ill., Ohio, and Va.; Eurasia.

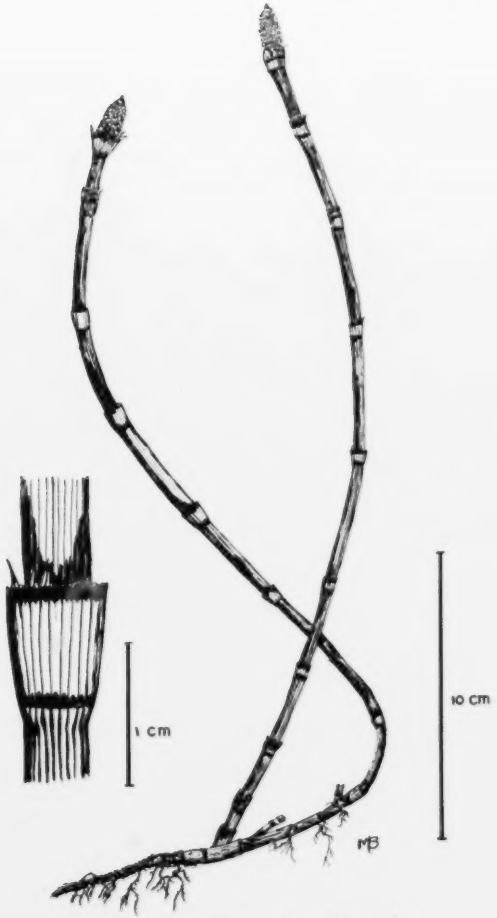
Comments.—This species, which is common throughout the Province, often occurs in numbers sufficient to form striking communities in shallow water. The large diameter of the central cavity, the tendency to branch mostly above the middle, and the reddish, shining, basal part of the stem are useful distinguishing features. Plants considered to be hybrids between *E. fluviatile* and *E. arvense* have been named *E. litorale* Kuhl. They combine in various degrees characters of both species; the central cavity is one-half to two-thirds the diameter of the stem, the vallecular cavities are often well developed, and the spores are mostly aborted.

Equisetum hiemale L. Scouring-rush

Rhizome felted, widely creeping, branched, growing deep in the ground. Stems glaucous-green, all alike, erect, unbranched except sometimes following injury, evergreen, up to 15 dm. tall, 4–6 mm. in diameter, mostly 18–40-ridged; ridges broad, rounded, roughened with prominent cross-bands of silex or 1 or 2 rows of fine tubercles. Central cavity two-thirds the diameter of the stem; vallecular cavities small. Sheaths cylindrical, appressed, about as long as broad, 4–15 mm. long, the ridges 2-furrowed, at first green, later with a black band above and below. Teeth as many as the grooves, lanceolate, fused at the base, dark brown with broad scarious margins, subulate-tipped. Cones stoutly apiculate, short-stalked, almost sessile in the uppermost sheath.



Equisetum fluviatile L. Swamp horsetail.



Equisetum hiemale L. Scouring-rush.

Habitat.—Damp alluvial situations, often in partial shade.

Range.—Alaska to N.S., s. to Calif., Tex., Ga., and Fla.; Eurasia.

Comments.—A widely ranging, highly variable species found generally throughout British Columbia. Many forms have been named, but there is so much intergradation that the value of this practice is doubtful. The three varieties in western North America that seem most characteristic are var. *pseudohiemale* (Farw.) Morton, with teeth of the sheaths promptly and uniformly deciduous (as illustrated); var. *elatum* (Engelm.) Morton, with teeth persistent and a single row of tubercles on the ridges; and var. *californicum* Milde, said to be similar to the last but with 2 rows of tubercles.

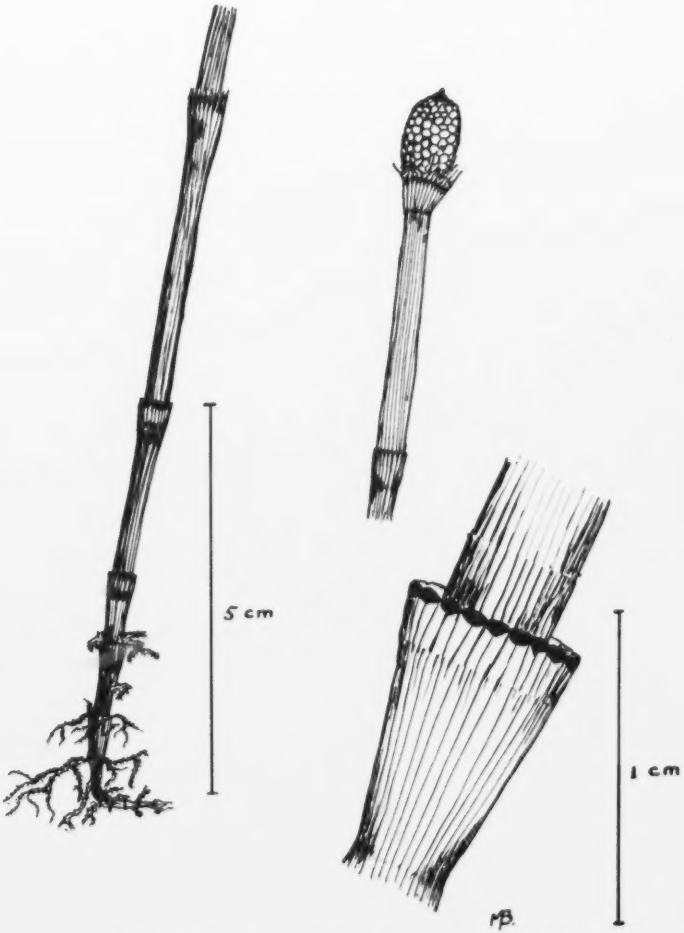
Equisetum lævigatum A. Br. Smooth Scouring-rush

Rhizome glabrous, felted only at the nodes, branched, creeping. Stems usually annual, all alike, pale yellow-green or rather glaucous, erect, normally unbranched, up to 10 dm. tall, mostly 14–26-ridged; ridges roundish, smoothish, tubercles scarcely, if at all, developed. Central cavity three-fourths the diameter of the stem or less; vallecular cavities small; stomata borne in 2 rows in the grooves. Sheaths subcylindric-funnelform, 5–15 mm. long, contracted at the base, flaring toward the apex, black-banded at the apex only, or the lowest black at the base as well or throughout, the ridges with 2 furrows. Teeth lanceolate-subulate, dark with broad scarious margins, promptly and uniformly deciduous. Cones either apiculate or blunt, short-stalked.

Habitat.—Dry sandy or clay soil in the open.

Range.—B.C. to Ont., s. to Calif., Tex., La., Mo., N. Dak., Minn., Ill., Ga., and N.J.; Mexico and s. to Guatemala.

Comments.—The status of this and one or two related species is still not clear and probably can only be settled by experimental investigation. There is doubt as to whether or not the stems are always annual. The strictly annual form has been described as *E. kansanum* Schaffner but is not generally considered to be speci-



Equisetum lævigatum A. Br. Smooth scouring-rush.

fically distinct. There do seem to be good grounds, however, for maintaining *E. lævigatum* as a species distinct from *E. hiemale*. From the latter it can be distinguished by its long flaring sheaths and the narrow dark band formed by the bases of the early deciduous teeth. In British Columbia this species is found only in the dry valleys of the interior from Kamloops southward.

***Equisetum palustre* L. Marsh Horsetail**

Rhizome glabrous, shining black, creeping and somewhat branched, lacks both felt and tubers, deeply subterranean. Stems annual, all alike, erect or somewhat decumbent, solitary or clustered, up to 6 dm. tall and 4 mm. in diameter, deeply 7–10-ridged; ridges smooth or slightly rough but lacking spinules. Central cavity mostly about one-sixth the diameter of the stem, vallecular cavities nearly as large. Sheaths gradually widened upwards, usually 9–14 mm. long, teeth persistent, free, lanceolate, acuminate, 1-ribbed, with blackish-brown central portion and a broad white hyaline margin. Branches few and irregular, or numerous and regularly whorled, slender, nearly smooth, the sheaths 5- or 6-toothed, the basal ones blackish, the first internode much shorter than the subtending stem-sheath. Cones borne at the tip of the main stem, long-stalked, obtuse, deciduous; occasionally smaller ones form at the tip of branches.

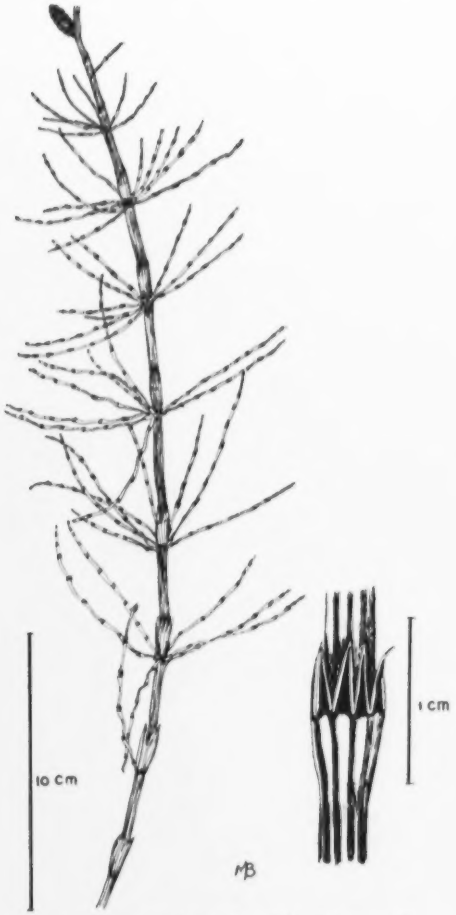
Habitat.—Shallow water and wet marshy places.

Range.—Alaska to Lab., s. to Ore., Mont., Wyo., Neb., Ill., n. Pa., Vt., Me., and Nfld.; Eurasia.

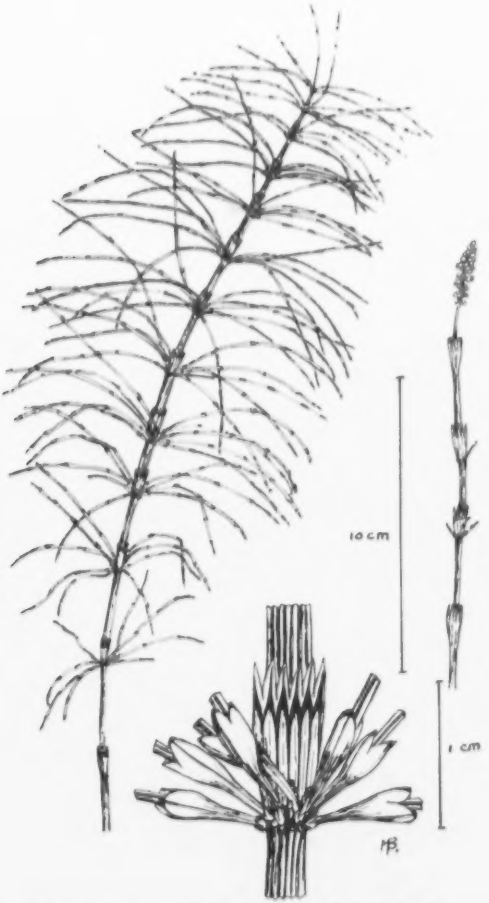
Comments.—To be expected in suitable habitats throughout the Province. Sterile stems may be confused with those of *E. arvense* but can be recognized by the small size of the central cavity, by the lowermost internode on the branches being shorter than the adjacent stem-sheath, and by the 5- or 6-toothed branch-sheaths.

***Equisetum pratense* Ehrh. Meadow Horsetail**

Rhizome black, creeping. Stems annual, erect, 20–50 cm. tall, of two kinds. Sterile stems pale green, mostly solitary, central



Equisetum palustre L. Marsh horsetail.



Equisetum pratense Ehrh. Meadow horsetail.

cavity one-third to one-half the diameter of the stem, vallecular cavities 10–18 with as many ridges; ridges much broader than the deep grooves, slightly roughened with fine spinules. Sheaths subcylindric, green, up to 8 mm. long; teeth persistent, lanceolate, acuminate, coherent at the base, each with a dark-brown central stripe and a scarious margin. Branches solid, numerous, regularly whorled, slender, mostly 3-angled, smooth, unbranched. Branch-sheaths rather loose and flaring upwards, 3-toothed; teeth deltoid, acute, white-margined, about one-third the length of the tube of the sheath, the lowermost pale brown. First internode mostly equalling or shorter than the subtending stem-sheath. Fertile stems normally unbranched at first, later developing whorls of branches similar to those on the sterile stems; sheaths somewhat longer and more conspicuous. Cone obtuse, long-peduncled, soon withering and deciduous.

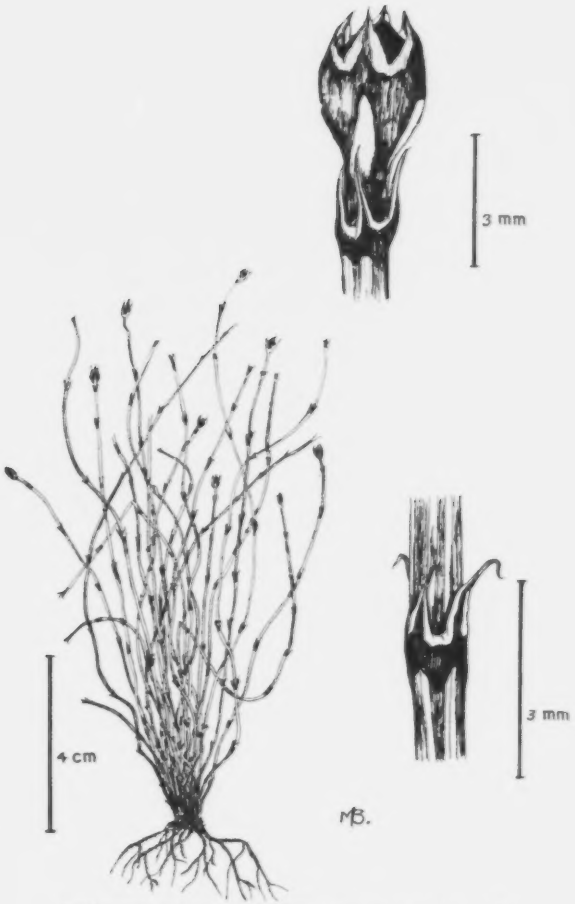
Habitat.—Grassy stream-banks and edges of damp woods.

Range.—Alaska to N.S., s. to B.C., Wyo., Colo., Iowa, and N.J.; Eurasia.

Comments.—A boreal, circumpolar species but found only east of the coastal mountains in British Columbia. Sterile shoots may be mistaken for those of *E. arvense* but can be identified by the flaring branch-sheaths with short, white-margined, deltoid teeth.

Equisetum scirpoides Michx. Dwarf Scouring-rush

Rhizome creeping, shallow, much branched, filiform. Stems evergreen, all alike, numerous, densely tufted, prostrate or ascending, arched-recurving and flexuous or zigzag, very slender, up to 16 cm. long, unbranched or with a few irregular, elongated branches, 3-ridged. Ridges broad and deeply grooved so that the stem appears 6-ridged. Central cavity lacking, vallecular cavities conspicuous, 3 (or 4). Sheaths 3–4 mm. long, enlarged and darkened upwards, teeth 3, triangular, acuminate, scarious-margined, the basal part persistent. Cones black, small, 2–5 mm. long, subsessile, apiculate.



Equisetum scirpoides Michx. Dwarf scouring-rush.

Habitat.—Open springy banks and damp coniferous woods.

Range.—Circumboreal; Alaska to Lab., s. to Wash., Mont., Minn., Ont., and N.Y.; Greenland; Eurasia.

Comments.—This curious little species is often overlooked because of its habit of growing among mosses or somewhat buried by humus in coniferous woods. The thin flexuous zigzag stems and its small size are characteristic. Apparently rare west of the coastal mountains in British Columbia, although not uncommon in the interior of the Province.

Equisetum sylvaticum L. Wood Horsetail

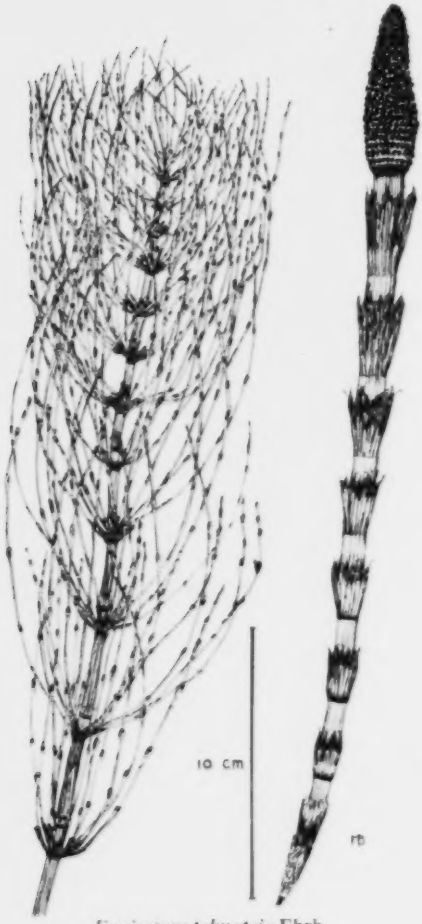
Rhizome creeping. Stems annual, erect, up to 70 cm. tall, of two kinds. Sterile stems green, mostly solitary, smooth or nearly so, the central cavity more than half the diameter of the stem, with 10–18 conspicuous vallecular cavities and the same number of ridges, each ridge with two rows of delicate, sharply hooked spinules. Sheaths subcylindric, 1–2 cm. long, green at the base, chestnut-brown above; teeth persistent, irregularly coherent into 3–5 groups. Branches numerous, tending to droop at the ends, irregularly whorled; first internode longer than the subtending stem-sheath, deeply 4- or 5-angled, simple or mostly branched again. Ultimate branches delicate, filiform, 3-angled, their sheaths deeply 3-toothed. Fertile stems shorter, green to flesh-coloured, at first unbranched but later producing whorls of mostly compound branches. Stem-sheaths larger, loosely inflated and flaring upwards. Cone obtuse, long-peduncled, soon withering.

Habitat.—Cool, moist, somewhat open woods in mildly acid soils.

Range.—Alaska to Lab., s. to Mont., S. Dak., Iowa, Ohio, W. Va., N.C., and Md.; Eurasia.

Comments.—In British Columbia this species has been collected only east of the coastal mountains. Eurasian plants nearly always have branches that are scabrous, particularly at their bases; in North America, however, there is a marked tendency for the branches to be smooth right to the base. Specimens showing this

Equisetum sylvaticum L. Wood horsetail.



Equisetum telmateia Ehrh.
Giant horsetail.

characteristic can be placed in var. *pauciramosum* Milde. Both forms occur in the Province.

***Equisetum telmateia* Ehrh. Giant Horsetail**

Rhizome felted, often bearing pear-shaped tubers. Stems annual, up to 2 m. tall, of two kinds. Sterile stems coarse, erect, mostly solitary, dirty white or pale green, grooves fine, 20–40. Ridges of internodes somewhat scabrous, central cavity nearly five-sixths the diameter of the stem, vallecular cavities large. Stem-sheaths 2–6 cm. long, cylindrical, appressed, pale, blackish above; teeth one-fourth to one-half as long as the tube, persistent, united in groups of 2 or 3 elongated, with broad hyaline margins. Branches solid, numerous, in dense spreading whorls, 4–6-angled, their sheaths with 2-ribbed teeth. First internode much longer than the subtending stem-sheath. Fertile stems unbranched, very stout, succulent, whitish or pale brownish, up to 60 cm. tall and 2.5 cm. thick, appearing before the sterile stems but soon withering. Sheaths 4.0–9.5 cm. long, loose, membranous, whitish below, brown above, the lower ones often longer than the internodes; teeth brown, lance-attenuate. Cone obtuse, 4–8 cm. long, very thick, hollow, long-peduncled. (*E. maximum* Lam.)

Habitat.—Low, wet ground, swamps, borders of streams.

Range.—B.C. to Calif.; Keweenaw Pen., Mich.; Eurasia; North Africa.

Comments.—Limited to the coastal regions in the southern half of the Province where it is very common. Not reported from east of the coastal mountains. Small individuals can be distinguished from large specimens of *E. arvense* by the larger, looser sheath with 2-ribbed teeth; the greater number of teeth in both branch- and stem-sheaths is also diagnostic.

***Equisetum variegatum* Schleich. Northern Scouring-rush**

Rhizome black and shining, widely creeping near the surface of the ground, much branched. Stems slender, evergreen, all alike, clustered, ascending to erect, up to 4 dm. tall, simple or branched

Equisetum variegatum Schleich. Northern scouring-rush.

from near the base but without axillary whorls, 5–10-ridged; the ridges finely 1-grooved with 2 rows of minute tubercles. Central cavity about one-third the diameter of the stem; vallecular cavities conspicuous. Sheaths mostly 3–5 mm. long, green to ashy with a broad black band around the top, tight below, rather loose above, the ridges 3-furrowed. Teeth persistent, triangular-ovate to broadly lanceolate, white scarious-margined with a blackish centre, abruptly acuminate, tips deciduous. Cones subsessile, sharply apiculate.

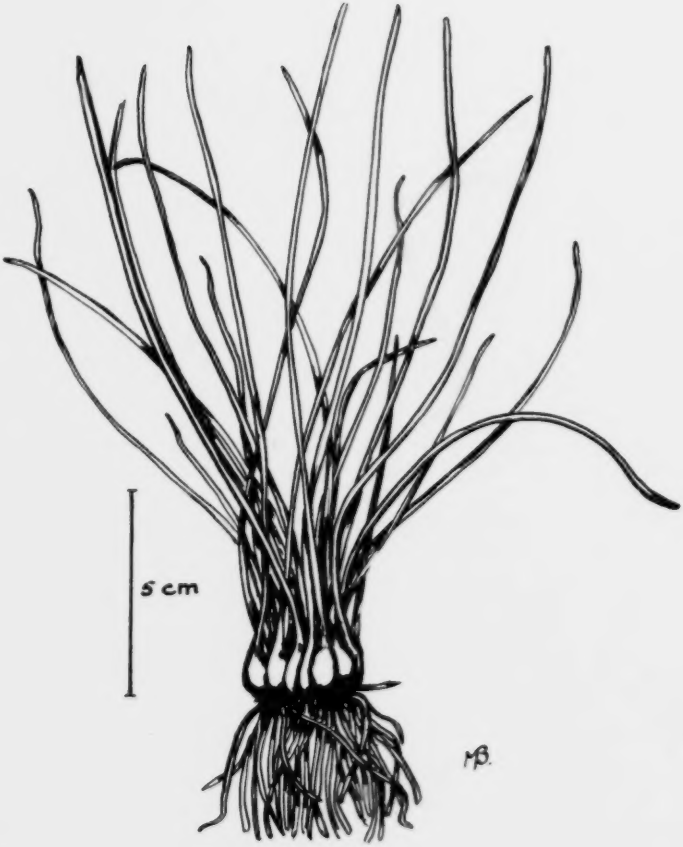
Habitat. — Sandy shores, wet thickets, banks of mountain streams.

Range.—Arctic regions; Alaska to Lab., s. to Ore., Wyo., Colo., Wis., Ill., and Pa.; Greenland; Eurasia.

Comments.—Common in suitable sites throughout British Columbia. This is a very variable species in which several varieties have been described; one of these, var. *alaskana* A. A. Eaton, is reported from our region. It is characterized by its greater diameter of 4 mm. and tight, not flaring, sheaths. It appears, however, to be only a more robust form of the species as intergrades between it and the typical form are quite common. Hybrids between this species and both *E. hiemale* and *E. lævigatum* have been reported.

ISOËTACEÆ—QUILLWORT FAMILY

Submerged, amphibious, or terrestrial perennials. Stem (a fleshy corm-like structure) flattened on top, 2–5-lobed, up to 2.5 cm. in diameter, crowned by leaf-bases. Leaves numerous, spirally arranged, simple, elongate-subulate, up to 50 cm. long, dilate and imbricate at base, rounded or quadrate or triangular in cross-section above, hollow, divided into 4 longitudinal, septate cavities. Sporangia of two sorts but solitary, large, globose to oblong, immersed in the ventral side of the leaf-base, more or less covered by a membrane (the velum); ligule a small triangular or elongate delicate tissue borne just above the sporangium. Spores of two kinds; microspores very small and numerous, powdery, essentially smooth;



Isoëtes sp.

megaspores few and up to 0.25 mm. in diameter, chalky white when dry, triradiate ridges variously decorated by spines, tubercles, or crests, rarely smooth.

A family consisting of a single genus of world-wide distribution.

***Isoëtes* L. Quillwort**

Characters are those of the family.

The identification of species in this genus is very difficult and requires the use of a compound microscope. For this reason no attempt is made here to differentiate the 3 species found in the Province; they are *I. muricata* Dur., *I. maritima* Underw., and *I. truncata* (A. A. Eaton) Clute.

LYCOPODIACEÆ—CLUB-MOSS FAMILY

Perennial moss-like plants, terrestrial (our species) or epiphytic. Stems elongate, simple to much branched, upright or trailing, roots arising from the underside; leafy nearly throughout. Leaves small, simple, 1-nerved, numerous, mostly 4–10-ranked, reflexed or ascending, free or partly adnate to the branchlets, evergreen, entire or slightly toothed, mostly lanceolate or linear. Sporophylls either like or unlike the vegetative leaves, in the latter case usually aggregated into a terminal cone or strobilus. Sporangia solitary, axillary or on the upper surface of the sporophylls, large, 1 mm. in diameter or more, kidney-shaped or spherical. Spores tetrahedral, all alike, smoothish or variously sculptured.

The family consists very largely of a single, almost cosmopolitan, genus of about 200 species, the majority of which are found in tropical and sub-tropical regions. (Name derived from the Greek *lycos* (wolf) and *pous* (foot), from a fancied resemblance.)

LYCOPODIUM L. Club-moss

Characters those of the family.

a. Sporangia in the axils of ordinary green leaves, not forming definite cones; broad and flat gemmæ (reproductive buds) often borne in the upper axils ..... *L. selago*

aa. Sporangia in clearly differentiated terminal cones; gemmæ lacking.

b. Sterile branches creeping, never ascending; cones solitary at the end of a slender branch growing directly from the creeping base. Sporophylls green, essentially like foliage leaves ..... *L. inundatum*

bb. Sterile branches erect or strongly ascending from the horizontal, superficial or subterranean stems; cones with yellowish, scale-like sporophylls, borne on erect leafy branches.

c. Ascending branches simple or few-forked; leaves uniform, spirally arranged in several ranks, with slender subulate to hair-like tips; lowermost sporophylls erose to fimbriate with subulate-aristate to hair-like tips.

Cones 1, sessile at the ends of densely leafy branches; sporophylls merely crenulate-erose, the lower ones (as well as the leaves) with subulate-aristate teeth ..... *L. annotinum*

Cones 1–6, stalked, on leafy-bracted peduncles; sporophylls fimbriate-erose, the lower ones (as well as the leaves) long attenuate to a soft tip ..... *L. clavatum*

cc. Ascending branches freely forking, tree-like, bushy-branched or fan-like; sporophylls entire or merely erose, acuminate to subulate-tipped.

d. Ascending branches erect and tree-like with very numerous, crowded ascending or recurved branchlets; leaves spirally to somewhat dorsiventrally arranged in 6 or 8 ranks, the free portion 3–5 mm. long; cones sessile at tips of unmodified branches ..... *L. obscurum*

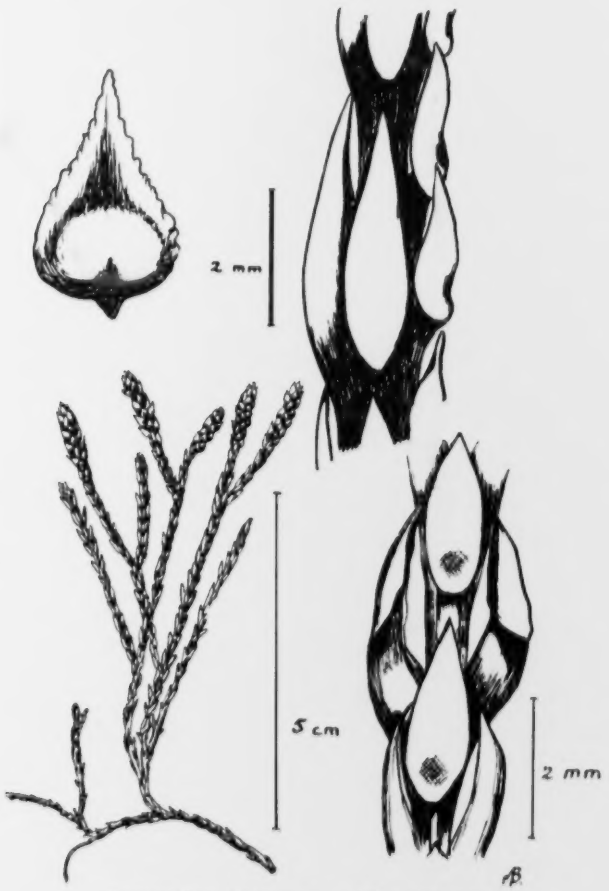
dd. Ascending branches tufted, bushy or fan-like branchlets flattened with minute leaves in 4 ranks, or if terete the leaves in 5 ranks. Cones on peduncle-like branches.

e. Sterile branchlets terete; leaves mostly in 5 ranks, all alike, the free, slenderly subulate tips longer than the adnate base ..... *L. sitchense*

ee. Sterile branchlets flattened; leaves in 4 ranks, those of the upper and lower faces unlike the marginal, the latter clearly decurrent.

Cones sessile, usually less than 2 cm. long; marginal leaves deltoid-ovate to deltoid-lanceolate, falcate, free tips about equalling the decurrent base, leaves of the lower surface trowel-shaped ..... *L. alpinum*

Cones usually peduncled and more than 2 cm. long; marginal leaves lance or deltoid subulate, free tips much shorter than the decurrent base, leaves of the lower surface subulate and appressed ..... *L. complanatum*



Lycopodium alpinum L. Alpine club-moss.

***Lycopodium alpinum* L. Alpine Club-moss**

Creeping stem nearly superficial, elongate, rooting throughout, up to 5 dm. or more long. Erect branches glaucous, tufted, several times dichotomously branched, 2–8 cm. tall, the branches short. Leaves of the somewhat flattened, sterile branchlets in 4 ranks, acuminate, entire, more or less of 3 forms, the dorsal lanceolate-subulate, appressed, 4–5 mm. long, adnate about half their length, the two marginal ones 4–5 mm. long, the free tips deltoid-falcate about equalling the decurrent bases; the ventral shorter, 2–3 mm. long, trowel-shaped, scarcely adnate at the concave base. Cones 1–2 cm. long, essentially sessile at the ends of branched, leafy, peduncle-like stems. Sporophylls yellow, broadly triangular, 3–5 mm. long, about 2 mm. wide, abruptly contracted at the base, gradually acuminate above, margins scarious, slightly erose.

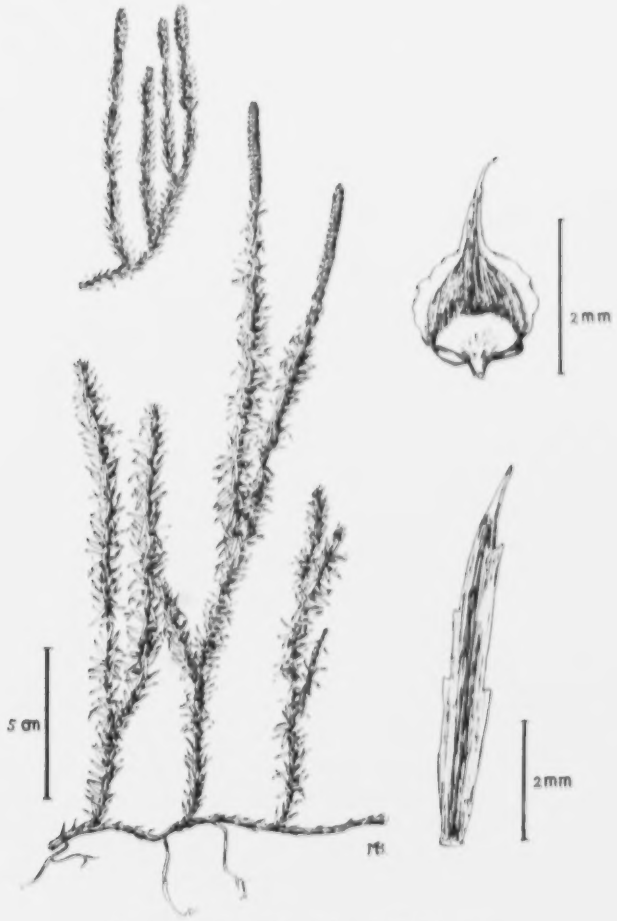
Habitat.—Alpine and subalpine meadows, cool woods at high altitudes.

Range.—Alaska, s. to Wash. and Mont.; Keweenaw Co., Mich.; Gaspé region, Que.; Greenland; Eurasia.

Comments.—This species of high elevations is apparently not common in our area. Collections indicate that it occurs widely if infrequently. It is very similar in general appearance and habit of growth to *L. sitchense*. It can be recognized by its more or less flattened branches with three types of leaves in 4 ranks; in particular the difference between the lower leaf and the two lateral ones is very marked.

***Lycopodium annotinum* L. Stiff Club-moss**

Stems trailing, elongate, up to 1 m. long, superficial or shallowly subterranean, most unbranched, 1.2–2.5 mm. thick, sparsely leafy. Erect branches not flattened, simple, or once or twice forked, annual increase in length conspicuous. Leaves 8-ranked with 4 leaves in each whorl, uniform, firm or stiff and hard, attenuate or linear-oblanceolate, acuminate, tipped by a short, stiff point, 2.5–11.0 mm. long, minutely serrulate or entire, reflexed or diver-



Lycopodium annotinum L. Stiff club-moss.

gent to appressed-ascending. Cones 1.5–4.0 cm. long, sessile and solitary at the ends of leafy branches. Sporophylls ovate, acuminate, with broad, scarious, denticulate margins, straw-coloured. Sporangia kidney-shaped, about 1.5 mm. wide.

Habitat.—Acid soil of wet woods or bog margins.

Range.—Boreal regions; Alaska to Lab. and Nfld., s. to Ore., Colo., Minn., Wis., Mich., mtns. of Va. and W. Va., Pa. and N.E.; Eurasia.

Comments.—A widespread species common throughout British Columbia. It shows considerable variation in different habitats, particularly those related to altitude. At low altitudes the growth is lax with relatively soft, reflexed leaves on the erect branches; at high altitudes growth is short and stiff with very firm, ascending or appressed leaves. Several of these forms have been named but they do not seem to have any geographic significance.

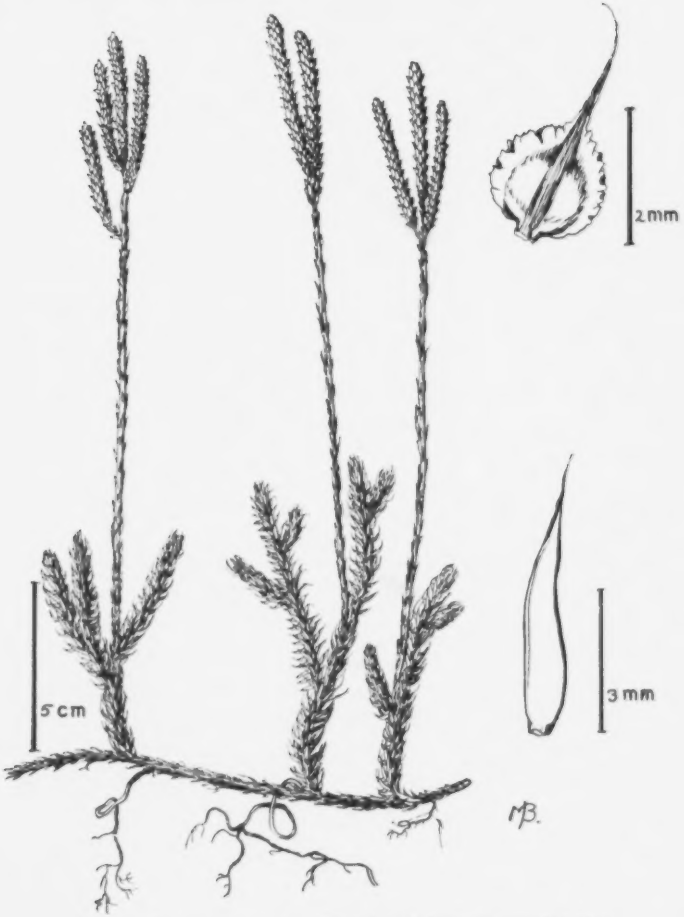
Lycopodium clavatum L. Running Club-moss, Running Pine

Horizontal stems on the surface of the ground, greatly elongated, up to 1 m. or more, rooting at intervals, 2–3 mm. thick, rounded. Erect stems, at first simple then more or less dichotomously branched, the branches mostly once forked, 5–25 cm. long. Leaves bright green, mostly in 10 ranks, uniform, incurved-spreading to appressed-ascending, linear-subulate, 4–7 mm. long, attenuate, usually tipped by a soft, white, hair-like bristle 2–3 mm. long, subentire to remotely serrulate. Peduncles 1.5–15.0 cm. long with distant, yellowish, linear-subulate, scale-like leaves. Cones cylindric, 1.0–11.0 cm. long, 1–4 or 5 to each peduncle; sporophylls ovate with white, filiform tips, margins broadly scarious-denticulate. Sporangia reniform about 1.5 mm. broad.

Habitat.—Dry woods and rocky places more or less in the open.

Range.—Alaska to Nfld., s. to Ore., Mont., Minn., Mich., s. N.C., and W. Va.; Eurasia.

Comments.—Very common west of the coastal mountains, much less so in the interior of the Province. Quite variable as to



Lycopodium clavatum L. Running club-moss, running pine.

the number of cones to each peduncle; var. *monostachyon* Hook. and Grev. with a single cone on a very short peduncle seems to be the response of the species to exposed, rocky situations at high altitudes. Of apparent geographic significance is var. *integerrimum* Spring, characterized by leaves lacking the soft terminal bristle. The great majority of British Columbia specimens can best be referred to this variety, which seems to be limited largely to this Province and Washington.

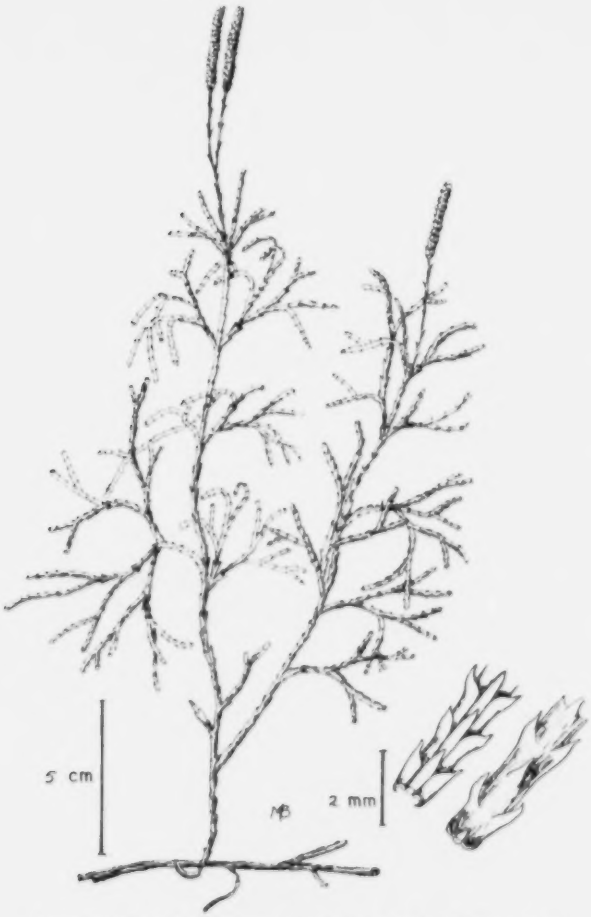
Lycopodium complanatum L. Ground-cedar, Ground-pine

Horizontal stem prostrate, wide creeping, on or near the surface of the ground, 1 m. or more long. Erect stems up to 3.5 dm. tall, much branched with crowded to loosely and remotely forked branchlets; branchlets obviously flattened, 2–3 mm. wide including the leaves, strongly constricted at the end of a season's growth. Leaves often somewhat glaucous-green, adnate over half their length, lanceolate-subulate, sharply acuminate, entire, 4-ranked, free tips of the lateral leaves lance- or deltoid-subulate, much shorter than the adnate portion; ventral leaves much smaller, 1 mm. long or less. Peduncles forked, 3–11 cm. long, with remote, reduced, nearly free, scale-like leaves. Cones cylindric, 1.0–2.5 cm. long. Sporophylls yellowish, orbicular-deltoid, 2.5–3.0 mm. long, 2 mm. wide, abruptly contracted at the base and abruptly cuspidate-acuminate above, margins scarious, erose. Sporangia reniform.

Habitat.—Dry woods and rocky hillsides in acid soil.

Range.—Alaska to Nfld., s. to Wash., Ida., Mont., Minn., Wis., n. Mich., Ont., and n. N.E.; Eurasia.

Comments.—Widely spread and common throughout the Province. Our form is var. *complanatum*, characterized by its rather loose irregular branching with indeterminate growth. This species shows affinities with *L. alpinum*, from which it can be distinguished by its much greater size, loose elongated branches, and the much-reduced ventral leaves with only their tips free.



Lycopodium complanatum L. Ground-cedar, ground-pine.

Lycopodium inundatum L. Bog Club-moss

Horizontal stem above ground, prostrate or arching, rooting at frequent intervals, particularly at the tip, flattened, up to 15 cm. long (but usually much less), somewhat branched. Leaves 4–6 mm. long, spirally arranged in 8 or 10 ranks, those of the lower side twisted to an ascending position, soft, linear- or lance-attenuate, gradually long-acuminate, entire. Fertile stems few, often only one, 3–8 cm. tall, erect; leaves similar to those of sterile stems, spiralled, ascending or slightly incurved. Cones 10–30 mm. long, 4–12 mm. thick, single, sessile. Sporophylls green, 5–7 mm. long, similar to the foliage leaves, much more spreading, narrowly ovate or lanceolate base. Sporangia subglobose.

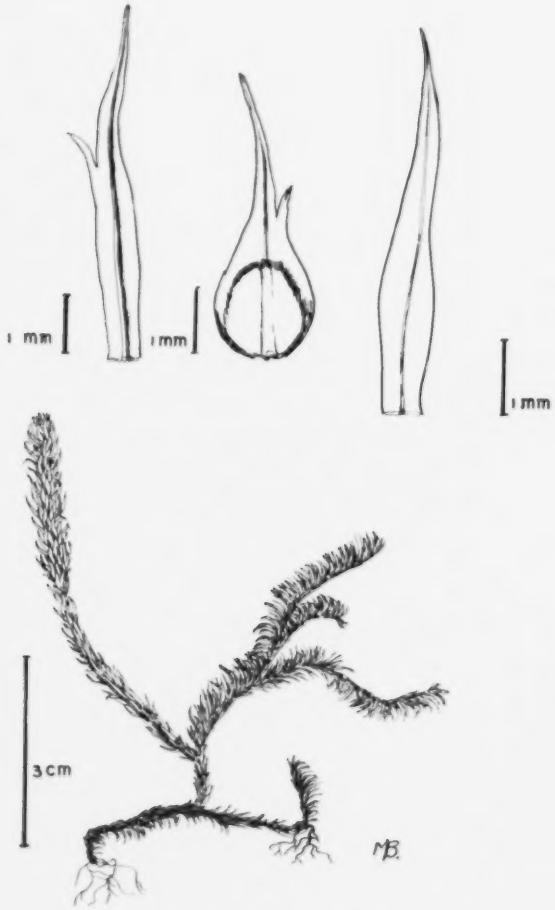
Habitat.—Cool, acid bogs, damp sandy slopes or shores.

Range.—Alaska to Nfld., s. to Ore., Idaho, Minn., n. Ill., n. Ohio, Pa., in mountains to w. Va. and W. Va.; Eurasia.

Comments.—In eastern North America three intergrading varieties have been named; in the West only var. *inundatum* is present. The small size of this species makes it apt to be overlooked by collectors. It is to be expected in suitable habitats throughout the Province, and is probably much more common than the rather limited number of records would indicate.

Lycopodium obscurum L. Ground-pine

Rhizome deeply subterranean, wide-creeping, forking at intervals to give off aerial stems up to 30 cm. tall, these mostly unbranched at the base but quite densely bushy-forked upwards so becoming tree-like. Sterile branchlets ascending, more or less erect or spreading or recurving at the tips. Leaves very numerous, shining, green, 6-ranked, linear-subulate, about 1 mm. wide, 3–5 mm. long, tips free, entire, acuminate, sharp-pointed, the lower series usually appressed, the lateral spreading or incurved-ascending. Cones cylindric, 1–4 cm. long, sessile, terminating erect, leafy branches. Sporophylls yellowish-brown, broadly cordate, abruptly short-acuminate, margins hyaline. Sporangia reniform.



Lycopodium inundatum L. Bog club-moss.

Lycopodium obscurum L. Ground-pine.

Habitat.—Acid soil of clearings, damp woods or bog margins.

Range.—Alaska to Nfld., s. to Ore., Mont., Minn., Mich., W. Va., and s. N.C.; Asia.

Comments.—Common throughout British Columbia. This species shows variation in the shape of the branchlets and the arrangement of the leaves. A form with rounded branchlets and leaves spreading uniformly in all planes has been distinguished as var. *dendroideum* (Michx.) D. C. Eaton. The typical form, which is commonest with us, has flattened branchlets with the leaves of the upper and lower planes smaller and subappressed. Intergradations between the two extremes are complete, however, and so they are not considered to be taxonomically significant.

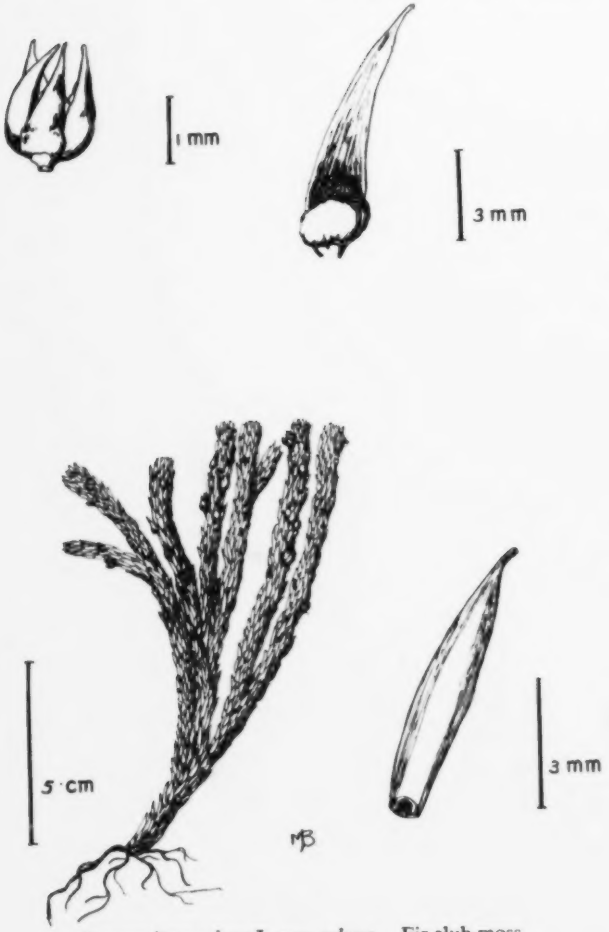
Lycopodium selago L. Fir Club-moss, Mountain Club-moss

Horizontal rooting stems short, marcescent. Erect stems usually tufted, 6–22 cm. tall, several times dichotomously branched. Branches densely or loosely ascending, often forming tight, more or less flat-topped tufts. Leaves 8-ranked, free, lanceolate, gradually acuminate, usually hollow at the base, nearly entire, lustrous, broadest at the base, often bearing dilated gemmæ in their axils. Cones not obvious, sporophylls like the vegetative leaves, borne in regularly alternating zones, each season's growth having a basal sterile zone and an apical fertile zone.

Habitat.—Sphagnum-bogs, shaded ledges of acid rocks, alpine and arctic regions.

Range.—Alaska to Nfld., s. to Ore., Mont., Mich., n. N.Y. and n. N.E., s. in the mountains to N.C.; Greenland; Eurasia.

Comments.—Another very variable species, found throughout the Province in some form or another. Numerous varieties have been described; the extremes appear quite distinct but are connected by a complete series of intergrading forms. In var. *selago* (as illustrated) the leaves are lance-attenuate, ascending; in var. *appressum* Desv. they are shorter, firmer, ovate-lanceolate and appressed or incurved; var. *patens* (Beauv.) Desv. is characterized



Lycopodium selago L. var. *selago*. Fir club-moss, mountain club-moss.

by strongly divergent or reflexed lance-attenuate leaves and loosely ascending stems; while in var. *myoshianum* Makino the leaves are very fine, narrowly lanceolate, and somewhat divergent. It is not known if these varieties have a genetic basis or are merely environmental responses. Field observations tend to support the latter view.

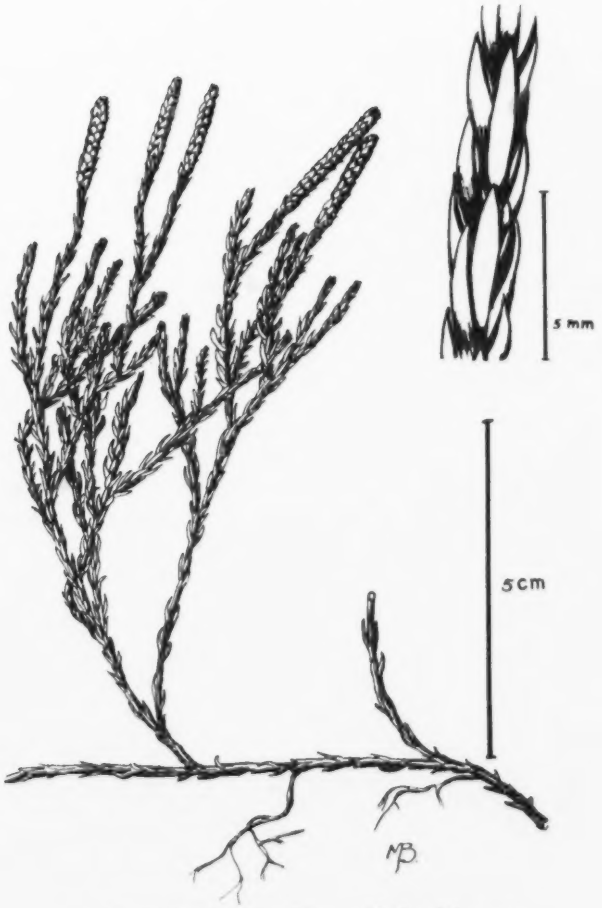
Lycopodium sitchense Rupr. Alaska Club-moss

Horizontal stems nearly superficial, elongate up to 50 cm. or more, rooting at intervals. Erect stems numerous, 7–15 cm. tall, several times dichotomously branched forming compact tufts; sterile branches not at all flattened. Leaves uniform, subulate, 3–4 mm. long, free tips usually longer than the decurrent base, sharply attenuate, entire, mostly in 5 ranks, spreading or mostly incurved-ascending. Cones 1.0–2.0 cm. long, solitary at the ends of short peduncle-like stems with small appressed, scale-like leaves. Sporophylls yellow-green, ovate-deltoid, 2.5–3.0 mm. long, 1.5–2.0 mm. wide, acuminate or subulate, the margins scarious and erose.

Habitat.—Subalpine woods, alpine meadows, and barren slopes.

Range.—Alaska to Nfld., s. to Ore., Idaho, Lake Superior region, and N.H.; e. Asia.

Comments.—Fairly common throughout at high altitude. May be found growing with *L. alpinum* and is apt to be confused with it. It can be readily identified by its generally terete, rather than flattened, branches without trowel-shaped ventral leaves; by its leaves in 5–6 rather than 4 ranks; and by the free tips of the leaves being longer than the adnate portion.



Lycopodium sitchense Rupr. Alaska club-moss.

MARSILEACEÆ—PEPPERWORT FAMILY

Perennial herbaceous plants rooting in mud. Rhizome spreading on, or just beneath, the surface, roots developing at the nodes. Leaves alternate in two rows, long-petioled, blade divided into four separate leaflets (in ours) that are upright and folded together in the mud, and at night. Sori developed within hard, ovoid, or subspherical sporocarps, these arising from the rhizome near the base of the leaf-stalks, or more or less consolidated with them. Spores tetrahedral in shape; microspores numerous but megaspores only one to a sporangium.

Delicate plants of aquatic and marshy places. A family of only three genera, widespread in tropical and warm temperate regions.

MARSILEA L. PEPPERWORT

Characters those of the family. A genus of about fifty species of small plants with clover-like leaves, mostly from the Old World.

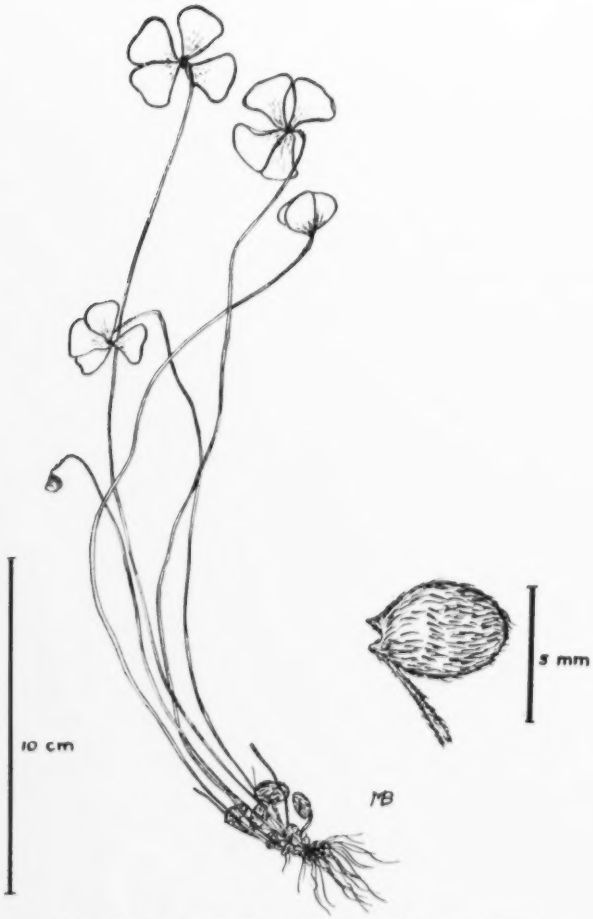
Marsilea vestita Hook. and Grev. Hairy Pepperwort

Rhizomes wide-creeping, clothed with reddish-brown, or tawny, silky hairs at the nodes. Leaves 4–20 cm. tall; petioles slender, hairy at first, later glabrous; blades 1–3 cm. broad; leaflets 5–15 mm. long, broadly cuneate, margins entire or nearly so, hairy at first. Peduncles short, mostly quite free from the petiole; sporocarps solitary, 4–8 mm. long, 3–6 mm. broad, at first very densely hairy, later more or less glabrous.

Habitat.—Edge of ponds and rivers, marshy places.

Range.—Southern B.C., s. to s. Cal., e. to s. Alta., S.D., Kan., Okla., and Texas.

Comments.—Extremely rare with us. First collected in the Province by Macoun in 1889 at Kamloops and not found again for sixty years until relocated there by Brayshaw. Recently reported by Calder and Savile from near Vernon.



Marsilea vestita Hook. and Grev. Hairy pepperwort.

OPHIOGLOSSACEÆ—ADDER'S-TONGUE FAMILY

Herbaceous, leafy, often fleshy plants with a short vertical rhizome bearing many fibrous, usually fleshy roots, and a single frond. Frond erect, consisting of a simple or variously compounded sterile blade and a simple or panicle-like compound fertile portion. Sporangia large, superficial or sunken in the leaf tissue, opening by two valves, annulus lacking. Spores thick-walled, very numerous, all of one type.

A small family of about ninety species in tropical and temperate regions, some of the tropical species being epiphytes.

BOTRYCHIUM Sw. GRAPE-FERN, MOONWORT

Fleshy terrestrial plants. Rhizome short and thick, erect, bearing a few unbranched, coarse, often corrugated roots. Leaves usually solitary, somewhat fleshy, glabrous or rarely clothed with simple hairs; base of the stalk containing the bud of next year's frond. Sterile blade sessile or long-stalked, 1–4 times pinnately or ternately compound. Fertile portion erect, a long-stalked, simple spike or variously pinnately compound panicle. Sporangia large, globose, free, mostly sessile, opening transversely by two valves. Spores very numerous, sulphur-coloured.

A cosmopolitan genus of about twenty-five species, usually preferring sub-acid damp soil in open or partially shaded situations. Often overlooked on account of the small size of some species. (Name from the Greek *botryos* (a bunch of grapes).)

a. Sterile blades simple to pinnate-pinnatifid, glabrous, longer than broad (except *B. lanceolatum*); buds glabrous; small, rather fleshy plants.

b. Sterile blades oblong to ovate, rarely deltoid; ultimate divisions rounded to obtuse; both fertile and sterile segments erect in bud or slightly inclined but never both completely reflexed.

c. Sterile blades simple or 1-pinnate; both leaf segments erect in the bud.

Sterile blades mostly sessile; pinnæ numerous, fan-shaped, usually all alike; stalk of the fertile portion usually shorter than the sterile ..... *B. lunaria*

Sterile blades stalked; pinnæ few, mostly obovate, not all alike; stalk of the fertile portion usually exceeding the sterile ..... *B. simplex*

cc. Sterile blades variously divided but usually 2-pinnate in mature specimens; in the bud the upper part of the sterile segment commonly bent down over and covering the erect fertile portion ..... *B. boreale*

bb. Sterile blades deltoid, essentially sessile; ultimate divisions acuminate; both segments completely reflexed in bud ..... *B. lanceolatum*

aa. Sterile blades 2-pinnate to 4-pinnatifid, broadly deltoid, rather large, sparsely pilose; buds pilose; larger plants with coarse, or finely dissected blades.

Sterile blades long-stalked, stalk arising from below ground or at least very low on the plant, evergreen, coriaceous or fleshy; stipe much shorter than the sterile blade ..... *B. multifidum*

Sterile blades sessile, deciduous, herbaceous; stipe equalling or exceeding the sterile blade ..... *B. virginianum*

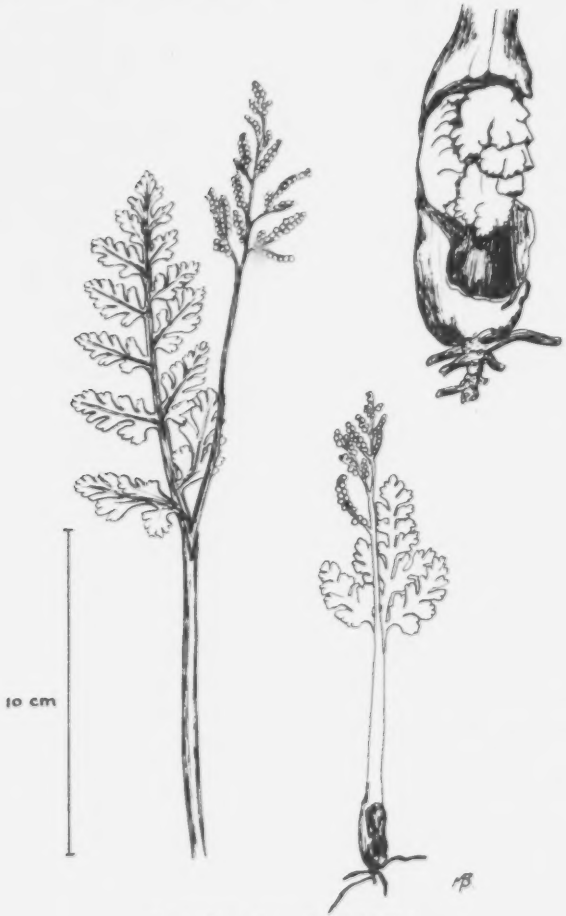
Botrychium boreale (Fr.) Milde. Northern Grape-fern

Plant relatively stout and fleshy, 4–26 cm. tall, bud glabrous. Fertile segment erect in bud, sterile blade with its apex bent over the tip of the fertile segment. Common stalk 3–14 cm. long. Blade inserted above the middle of the plant, usually sessile, 1–4 cm. wide, 1–9 cm. long, oblong-triangular to broadly oblong-lanceolate, pinnate-pinnatifid to 2-pinnatifid; lower pinnæ more or less stalked and decurrent, segments oblong and obtuse at the apex. Stalk of fertile segment 2–20 mm. long, mostly shorter than the blade. Fertile segment simple or paniculate, up to 5 cm. long. (*B. pinnatum* St. John.)

Habitat.—Open grassy places, alpine meadows, peaty soil.

Range.—Alaska to w. Alta., s. to Ore. and Mont.; Eurasia.

Comments.—A boreal and alpine species met with quite infrequently although of wide occurrence in the Province. Our form has been named ssp. *obtusilobum* (Rupr.) Clausen. Its ecological requirements are apparently similar to those of *B. lunaria* as the two species are often found growing together. The present species can be recognized by its more or less oblong blade, the pinnæ of which are lobed or divided into oblong and obtuse segments.



Botrychium boreale (Fr.) Milde.
Northern grape-fern.

***Botrychium lanceolatum* (Gmel.) Angstr. Lance-leaved Grape-fern**

Plant stout, fleshy, 6–42 cm. tall, both sterile blade and fertile segment completely reflexed in vernation. Common stalk 4–15 cm. long. Sterile blade sessile or nearly so, inserted near the summit of the plant, 1–9 cm. wide, 1–6 cm. long, glabrous, deltoid with dark-green, pinnate-pinnatifid, lanceolate segments, 1–6 mm. wide, of which the lowest pair is longest. Stalk of the fertile segment 5–11 mm. long, much shorter than the sterile blade. Fertile segment paniculate, 1–5 cm. long, rather compact with ascending branches.

Habitat.—Peaty slopes, open sandy places, alpine meadows and open woods.

Range.—Alaska to Nfld., s. to Wash., Colo., Wyo., Wis., Ont., Pa., and W. Va.; Greenland; Eurasia.

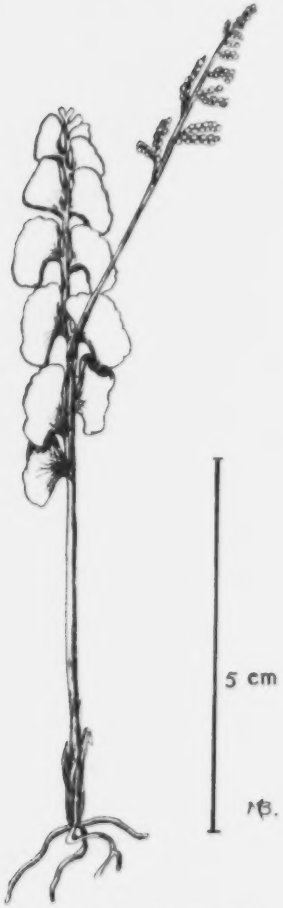
Comments.—Apparently rare but small enough to be overlooked. The few collections made in the Province are too scattered to give any idea of the pattern of its distribution, consequently the species is one that may be expected anywhere. The stalk of the fertile segment being very much shorter than the deltoid sterile blade is a useful diagnostic feature. All our specimens are referable to var. *lanceolatum* with thick fleshy blades and the lobes of the pinnæ rounded at the apex and broad at the base.

***Botrychium lunaria* (L.) Sw. Moonwort**

Stipe mostly 3–8 cm. tall; bud glabrous, included within the stipe-base, with both fertile and sterile portions erect. Sterile blade oblong to oblong-ovate, essentially sessile, attached at or slightly below the middle of the plant, somewhat leathery, glabrous, up to 6 cm. long and 3 cm. wide, pinnate. Pinnæ 3–7 pairs, more or less opposite, broadly fan-shaped to semi-circular, often overlapping, unequally curved at base, rounded at the apex, entire or somewhat incised, without a midrib. Fertile stalk up to 5 cm. long, mostly shorter than the sterile blade, fertile segment 1- or 2-pinnate.

Habitat.—Open places, alpine meadows, turfy slopes.

Botrychium lanceolatum (Gmel.) Angstr.
Lance-leaved grape-fern.



Botrychium lunaria (L.) Sw.
Moonwort.

Range.—Alaska to Nfld., s. to Calif., Ariz., Colo., Minn., Mich., and Me.; Greenland; Iceland; Eurasia; Patagonia; N.Z.; Australia.

Comments.—Generally distributed in the interior of the Province, but on account of its small size likely to be overlooked. One of our widest-ranging ferns and very variable in form; many of the minor variations have been named. In our region two are sufficiently distinctive for mention: var. *lunaria*, the commonest, has a broad oblong blade inserted toward the middle of the plant, while var. *miganense* (Vict.) Dole has a blade much longer than broad with variously shaped, but not usually flabellate, divisions often inserted somewhat below the middle of the plant.

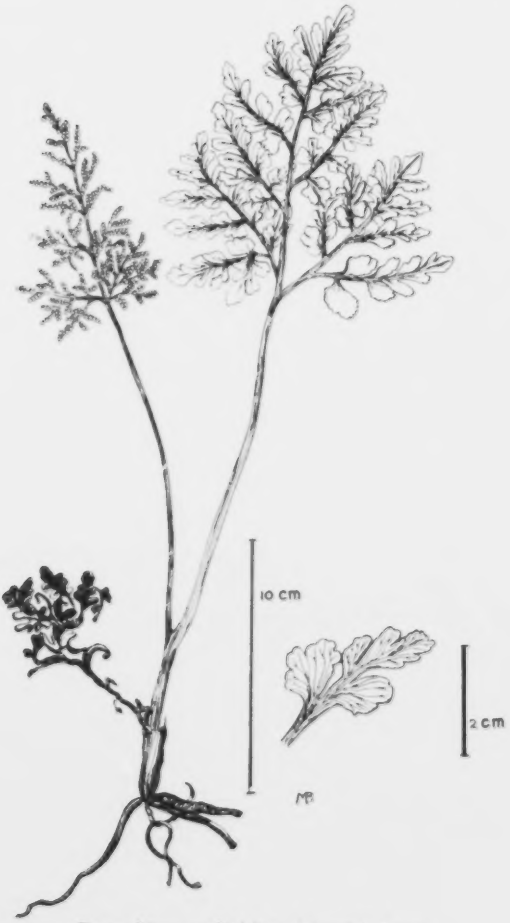
Botrychium multifidum (Gmel.) Rupr. Leathery Grapefern

Rhizome short with numerous long wrinkled roots. Stipe up to 7 cm. long; bud silky pilose, included within the closed stipe-base, the sterile and fertile portions completely reflexed in the bud. Stalk of the sterile blade up to 13 cm. long, stout, arising from near the base of the plant and usually underground. Blades evergreen, very fleshy to leathery, sparingly pilose, broad triangular, ternate, 2–4-pinnate, about as broad as long. Basal pinnæ largest, obtuse, more or less pentagonal, the ultimate divisions oval to obovate, obtuse, subentire to dentate, cuneate, decurrent. Fertile segment 2–4-pinnate, loose, spreading. (*B. silaifolium* Presl.)

Habitat.—Fields and open woods in acid soil.

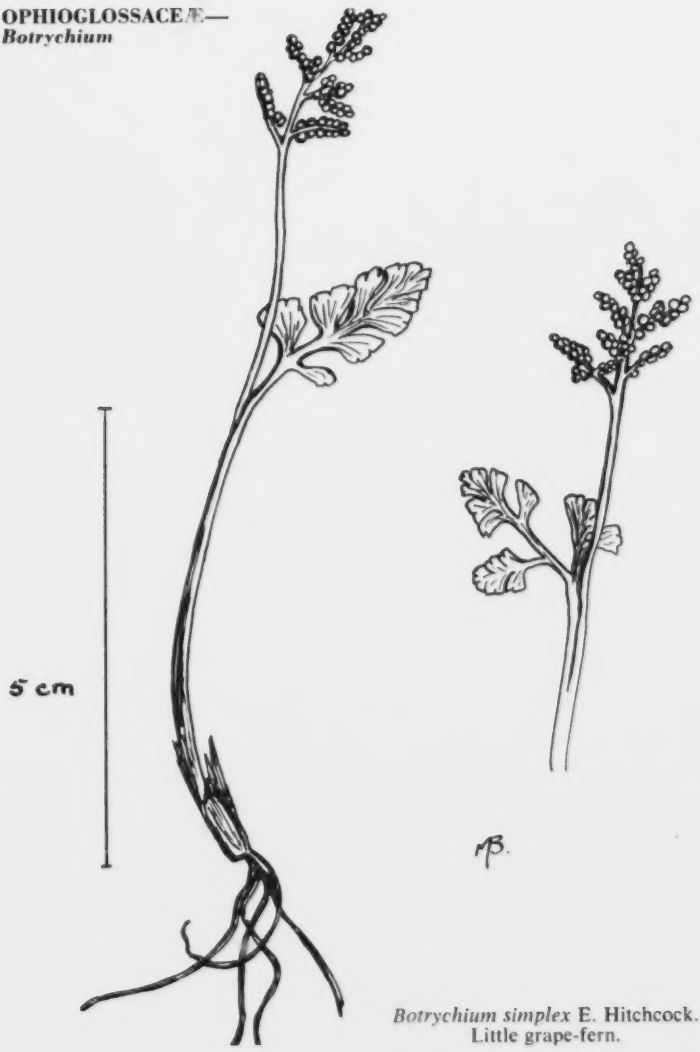
Range.—Alaska to Lab., s. to Calif., Mont., Iowa, Ohio, Pa., and N.J.; Eurasia.

Comments.—Common everywhere in suitable sites. Our plants nearly all belong to var. *intermedium* (D. C. Eaton) Farwell. This is characterized by its larger size, 15–40 cm. tall, with blades 7–15 cm. long and 3–21 cm. wide, the ultimate divisions being rather remote and not imbricate. This species is late in starting into growth in the spring; the sterile frond of the previous year may



Botrychium multifidum (Gmel.) Rupr.
Leathery grape-fern.

OPHIOGLOSSACEÆ.—
Botrychium



Botrychium simplex E. Hitchcock.
Little grape-fern.

be found persisting even until September. This feature, together with the fact that the stalk of the sterile blade arises from below ground, will distinguish this species from *B. virginianum*.

***Botrychium simplex* E. Hitchcock. Little Grape-fern**

Plants slender, somewhat fleshy, up to 16 cm. tall but usually much less. Bud glabrous, enclosed within the base of the stipe, both the fertile and the sterile portions erect or with the tip of the sterile slightly inclined over the tip of the fertile. Common stalk short, not more than 6 cm. long. Blade glabrous, usually with a definite petiole up to 20 mm. long, inserted toward the base, or at least below the middle of the plant, simple, pinnate, ovate to oblong. Pinnæ 1–4 pairs, essentially opposite, oblong, rhomboid or reniform, cuneate, mostly entire, the basal ones themselves rarely lobed. Fertile stalk up to 7.5 cm. long, usually much longer than the sterile blade. Fertile segment mostly 2-pinnate.

Habitat.—Open places, pastures, alpine meadows, and fine gravelly slopes.

Range.—B.C. to Nfld., s. to Calif., N.M., Colo., Wis., N.Y., Pa., and Mass.; Japan; Europe.

Comments.—This very variable little species is apparently quite rare in British Columbia. It is known from alpine areas near Nanaimo and in the Selkirks.

***Botrychium virginianum* (L.) Sw. Rattlesnake Fern**

Plant erect, 25–76 cm. tall, glabrous or sparsely pubescent. Bud pilose and, at least late in the season, partially exposed by the sheathing base which opens on one side. Fertile and sterile segments both completely reflexed in vernation. Common stalk 7–25 cm. long. Blade deciduous, thin and membranous, rarely somewhat leathery, deltoid, large, 4–21 cm. long, 5–36 cm. wide, nearly sessile, ternately decompound, much divided, basal pinnæ largest; ultimate divisions oblong-lanceolate, variously toothed or lobed, blunt or acutish. Fertile stalk 1–23 cm. long; spike 2- or 3-pinnately compound, 2.0–16.5 cm. long.

Botrychium virginianum (L.) Sw.
Rattlesnake fern.

Habitat.—Woods, meadows, and damp open places.

Range.—B.C. to Nfld., s. to Calif., Ariz., and Fla.; Eurasia.

Comments.—Widely spread and easily recognized by its thin, broadly triangular blade attached well above the ground. Two subspecies occur in our region: ssp. *virginianum* and spp. *europæum* (Angstr.) Clausen. The latter has a more compact, leathery blade, with the pinnæ not so deeply or finely divided, the ultimate divisions often being crowded or imbricate; the valves of the sporangia are usually not widely spreading or recurved in dehiscence.

POLYPODIACEÆ—POLYPODY FERN FAMILY

Leafy plants (ours all herbaceous) of various habits. Rhizomes creeping or erect, not much branched, often clothed with scales. Fronds usually rather large, stalked, erect, spreading or drooping. Blades circinate in bud, simple or variously compound, glabrous or pubescent, sometimes glandular; fertile and sterile fronds alike, or in some cases dissimilar. Sporangia grouped together in sori; these are dorsal and various in shape and size, sometimes covered, or enclosed by a membranous indusium. Sporangia usually long-stalked, somewhat helmet-shaped (the annulus being the crest), elastically dehiscent through the action of the hygroscopic cells of the annulus.

A very large family of over 150 genera and probably more than 7,000 species. World-wide in distribution but most abundant in damp tropical regions; contains most of the plants familiarly known as ferns.

a. Sori on or near the margin of the lower surface of the frond, covered by the inrolled indusium-like margin, or apparent margin.

b. Sori clearly separate, borne on the underside of reflexed margins of pinnæ; segments of frond fan-shaped ..... *Adiantum*

bb. Sori continuous along the margin of the reflexed frond segment; frond segments more or less oblong or linear-lanceolate.

c. Rhizome coarse, much elongated, with hairs only lacking scales; fronds scattered, very large and coarse ..... *Pteridium*

cc. Rhizome very short, scaly but often with hairs; fronds mostly clustered, much smaller, sometimes quite delicate.
d. Stipes herbaceous, green except at the base; fertile and sterile fronds very dissimilar, glabrous ..... *Cryptogramma*
dd. Stipes wiry, dark and shining.
Pinnules and ultimate segments of fronds jointed at base; inrolled margins much modified, elongate and continuous; fertile fronds with narrower segments than the sterile ..... *Pellæa*
Pinnules and ultimate segments of frond not jointed at base; inrolled margins scarcely modified, short and mostly not continuous; fertile and sterile fronds alike ..... *Cheilanthes*

aa. Sori on the lower surface of the frond, not covered by the margin (in *Blechnum* the indusium may appear marginal).
b. Sori continuous along both sides of the midrib of the linear pinnæ; fertile fronds with much narrower pinnæ than the sterile ..... *Blechnum*
bb. Sori not as above; sterile and fertile fronds much alike, or if markedly dissimilar then the fertile fronds linear, stiffly erect.
c. Indusium present, at least on young fertile fronds.
d. Indusium inferior, borne in part at least beneath the sporangia, cup-shaped, hood-like, or deeply lacerate into filamentous segments.
e. Fertile and sterile fronds very dissimilar, coarse and stiff; fertile segments pod-like ..... *Matteuccia*
ee. Fertile and sterile fronds alike, delicate, not stiff; sori flat or convex.
Indusium borne symmetrically under the sorus, splitting into filamentous segments; veins not reaching the margin ..... *Woodsia*
Indusium hood-like, attached at one side, partly under the sorus; veins reaching the margin ..... *Cystopteris*
dd. Indusium superior, either centrally attached at a point or with a lateral linear attachment.
e. Indusium peltate or attached at its centre, more or less circular or kidney-shaped.
f. Indusium centrally attached, shield-shaped, without a deep sinus ..... *Polystichum*
ff. Indusium laterally attached, kidney-shaped or with a deep sinus.
Rhizome thick, short-creeping to erect; veins not reaching the margin ..... *Dryopteris*

Rhizome slender, creeping; veins reaching the margin ..... *Thelypteris*

ee. Indusium with a linear attachment, linear to lunate, hooked or horse-shoe shaped.

Blades small, 1-pinnate, evergreen; sori linear to oblong, straight or nearly so ..... *Asplenium*

Blades large, at least 2-pinnate; sori mostly hooked or horse-shoe shaped, often crossing veins ..... *Athyrium*

cc. Indusium lacking; sori roundish.

d. Fronds coriaceous, evergreen, simply pinnatifid; stipes jointed to the superficially creeping rhizome ..... *Polypodium*

dd. Fronds herbaceous, not evergreen, at least 2-pinnate; stipes not jointed to the rhizome.

e. Rhizome very stout, short, crowned by fronds and the remains of stipe-bases; fronds lanceolate, at least 3-pinnate ..... *Athyrium*

ee. Rhizome very slender, elongate and branched, fronds scattered or solitary, deltoid or broader.

Fronds more or less ternate, 2-pinnate-pinnatifid; lower pinnæ articulate at the base; glabrous and scaleless, sometimes glandular ..... *Gymnocarpium*

Fronds not ternate, 2-pinnatifid; lower pinnæ not articulate at the base, hairy and scaly throughout ..... *Thelypteris*

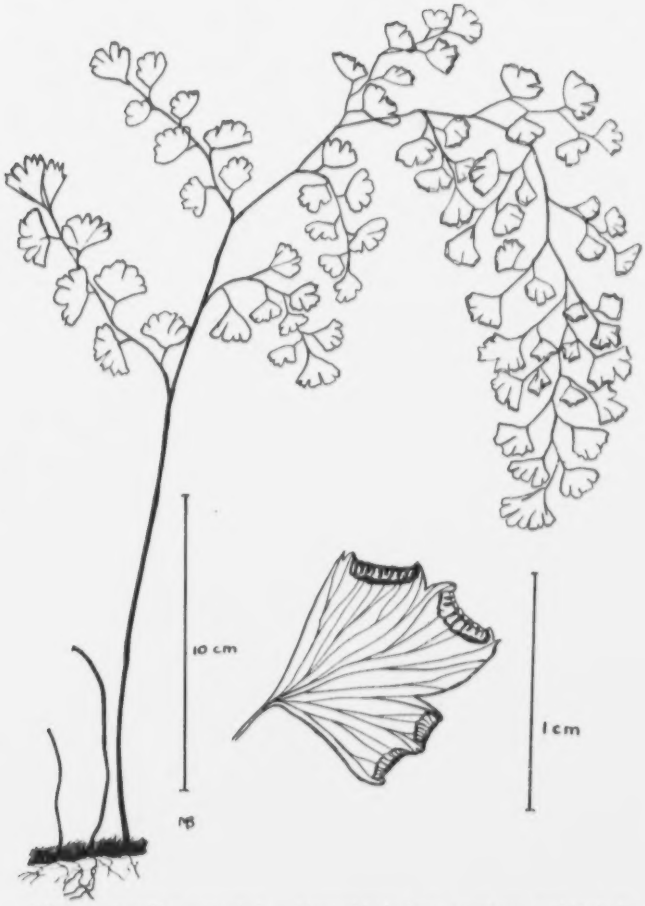
ADIANTUM L. Maidenhair Fern

Sori marginal, not continuous, the edge of the frond being reflexed to form the indusium. Midrib of the pinnules wanting (in ours) or close to the lower edge. Stipe black and shining. Pinnules distinct and short-petioled. (The classical name from the Greek *a* (not) and *diaine* (to wet), hence unwetted—the foliage sheds rain.)

A large genus of ferns of rich, damp soil in tropical and temperate regions. Many species are cultivated in greenhouses or out of doors in damp mild climates.

Rachis palmately branched ..... *A. pedatum*

Rachis unbranched ..... *A. capillus-veneris*



Adiantum capillus-veneris L. Venus'-hair fern, southern maidenhair.

Adiantum capillus-veneris L. Venus'-hair Fern, Southern Maidenhair

Rhizome slender, horizontal, producing a row of fronds, densely covered with narrow, brown scales. Fronds drooping, 15–50 cm. long, more or less evergreen, glabrous. Stipe lustrous black, continuing without branching as the main rachis of the frond, as long as or shorter than the blade. Blade ovate-lanceolate, 2–3-pinnate at the base becoming simply pinnate in the upper portion. Pinnules very thin, fan-shaped, mostly 1–3 cm. long, rather irregularly jagged-lobed, some of the lobes bearing the transversely oblong, or lunate, indusia. Veins dichotomously branched, free; midrib lacking. Sori close together along the veins of the recurved part of the lobes.

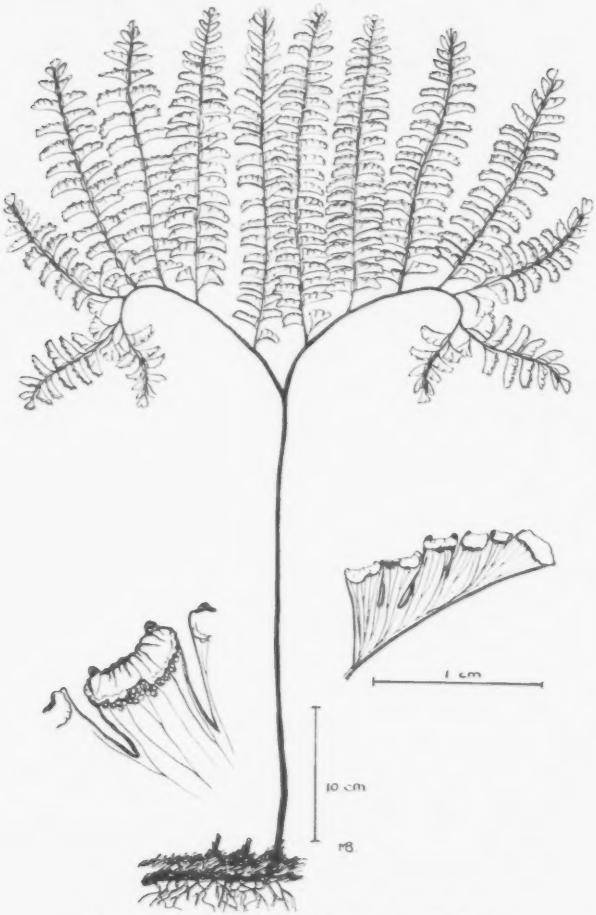
Habitat.—Damp, usually shaded cliffs of alkaline rocks, or limy soil.

Range.—Calif. through Tex. to Fla., n. to B.C., Utah, Colo., S.D., and sw. Va.; Eurasia.

Comments.—Widely distributed in tropical and warm-temperate regions of both hemispheres. In British Columbia it is known from the runnels of the hot springs at Fairmont, north of Columbia Lake. Despite the fact that the nearest known colony is some hundreds of miles to the south, there is very strong circumstantial evidence to support the view that it is indigenous at Fairmont and not an escape from cultivation. A recent collection on Saltspring Island (*Bryant*) is of great interest. Further investigation is necessary to make sure that it is native there.

Adiantum pedatum L. Northern Maidenhair

Rhizome slender, short-creeping, dark-coloured, producing a row of several fronds in one season. Fronds erect, up to 10 dm. tall, glabrous, deciduous. Stipes blackish or deep reddish-brown, lustrous, up to 6 dm. long, forking at the top into two, more or less equal, rachises that are widely divergent and arched-recurved. Frond fan-shaped, 2-pinnate, the pinnæ borne on the upper side



Adiantum pedatum L. Northern maidenhair.

of the rachises. Pinnules numerous, petioled, obliquely triangular-oblong, lobed on the upper margin. Sori marginal, covered by indusia formed by the reflexed tips of the lobes; indusium transversely linear or linear-oblong or lunate.

Habitat.—Shady situations in damp soil rich in humus.

Range.—Alaska to Nfld., s. to Calif., Utah, Okla., and Ga.; ne. Asia.

Comments.—Found in suitable habitats throughout the Province but commonest on the coast and in the Columbia Valley. The western form has been described as var. *aleuticum* Rupr. This differs by being more glaucous, with merely spreading to strongly ascending, not recurved, branches, and pinnæ with the upper margin often deeply and unequally cleft.

ASPLENIUM L. Spleenwort

Small to large, often evergreen, ferns of moist, particularly rocky, places. Fronds somewhat crowded, varying from rosettes to erect-spreading, with creeping or erect rhizomes. Stipes slender to filiform. Blades variously compound (simply pinnate in ours); glabrous, variously pubescent or slightly scaly; rachises green and soft to hard and lustrous. Sori oblong to linear, oblique; indusia always present, usually membranous, straight or slightly curved, attached lengthwise to the upper side of an ultimate veinlet.

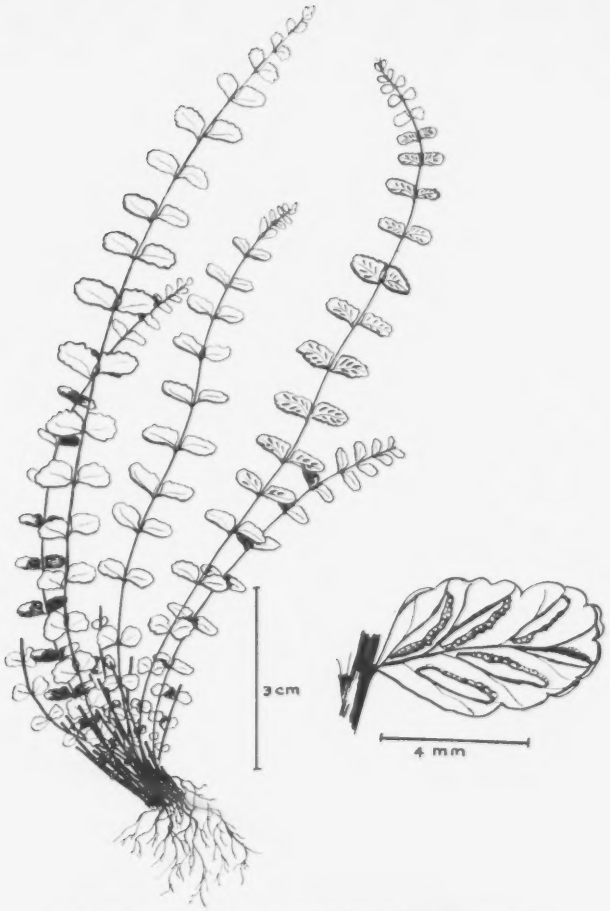
A very large genus mainly of tropical and sub-tropical regions in both hemispheres. (Ancient Greek name *Asplenon* used for some fern supposed to cure diseases of the spleen.)

Stipe and rachis dark brown, or purplish-brown throughout, glossy, somewhat stiff ..... *A. trichomanes*

Stipe sometimes reddish-brown below, the upper part and rachis green, lax, herbaceous ..... *A. viride*

Asplenium trichomanes L. Maidenhair Spleenwort

Rhizomes erect or decumbent, very short, forming dense tufts with many denuded old rachises. Fronds 8–22 cm. tall, widespreading; stipes slender up to 5 cm. long, curved, like the rachis



Asplenium trichomanes L. Maidenhair spleenwort.

dark chestnut to purplish-brown, lustrous, glabrous. Blades linear, 5–15 mm. broad, once pinnate, somewhat narrower below; pinnæ evergreen, roundish-oblong or oval, 3–8 mm. long, inequilateral at the cuneate to rounded base, lower ones progressively more distant, crenulate or shallowly crenate; veins mostly once forked. Sori 3–5 pairs, linear-oblong, medial; indusia ample, more or less entire.

Habitat.—Moist, often calcareous, crevices and rock ledges.

Range.—Alaska to N.S., s. through Ore. and Ariz., N. Dak., Wis., Ala., and Ga.; Eurasia; Africa.

Comments.—General throughout the Province and not limited to limestone or basic rocks. The bare stipes and rachises persist for several years after the pinnæ have been shed and may even be more numerous than the living fronds.

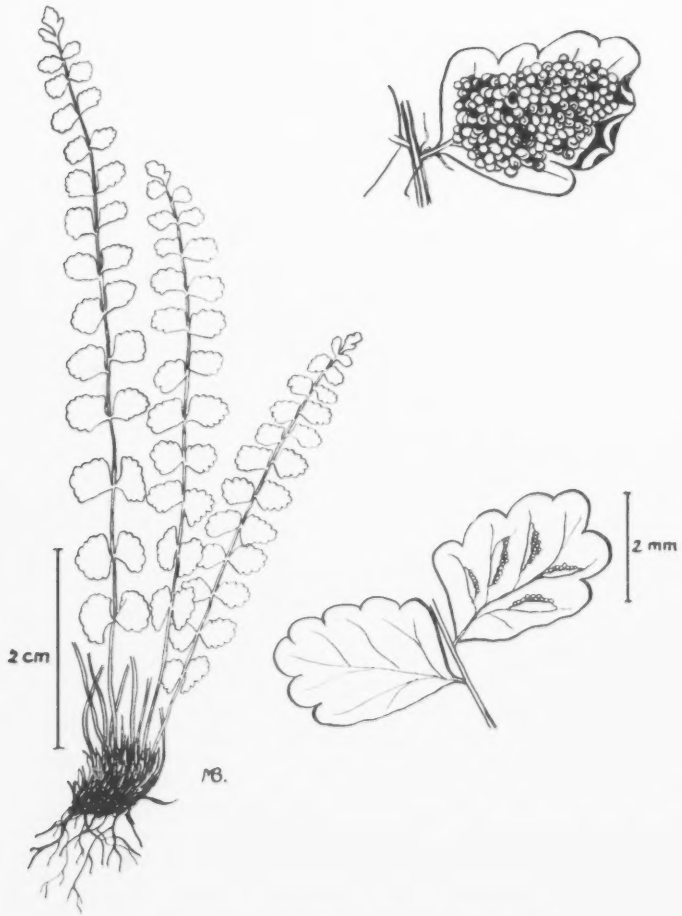
Asplenium viride Huds. Green Spleenwort

Rhizome with blackish scales, short but creeping. Fronds numerous, tufted, 2–13 cm. tall, laxly ascending; stipes 1–7 cm. long, pale straw-coloured to green from a reddish-brown base. Blades narrow, linear to linear-lanceolate, 2–14 cm. long, 5–15 mm. broad, somewhat attenuate, once pinnate; rachis delicate, green. Pinnæ soft, herbaceous, the lower ones opposite and somewhat remote, becoming progressively closer together and more alternate higher up, round or rhombic-ovate, stalked, broadly cuneate at the inequilateral base, crenate or crenately lobed. Sori in 2–4 pairs, nearest the rather indistinct mid-vein, soon confluent and concealing the delicate, subentire indusium.

Habitat.—Cool, shaded crevices in limestone or other basic rocks.

Range.—Alaska to Nfld., s. in mtns. to Ore., Colo., and Vt.; Greenland; Eurasia.

Comments.—Apparently rare with us, known from the southern Rockies in British Columbia; Forbidden Plateau and Ucluelet, V.I.; Queen Charlotte Islands; and Alice Arm. This delicate little



Asplenium viride Huds. Green spleenwort.

fern can always be recognized by its tufted habit, narrow linear frond with green to straw-coloured rachis.

ATHYRIUM Roth.

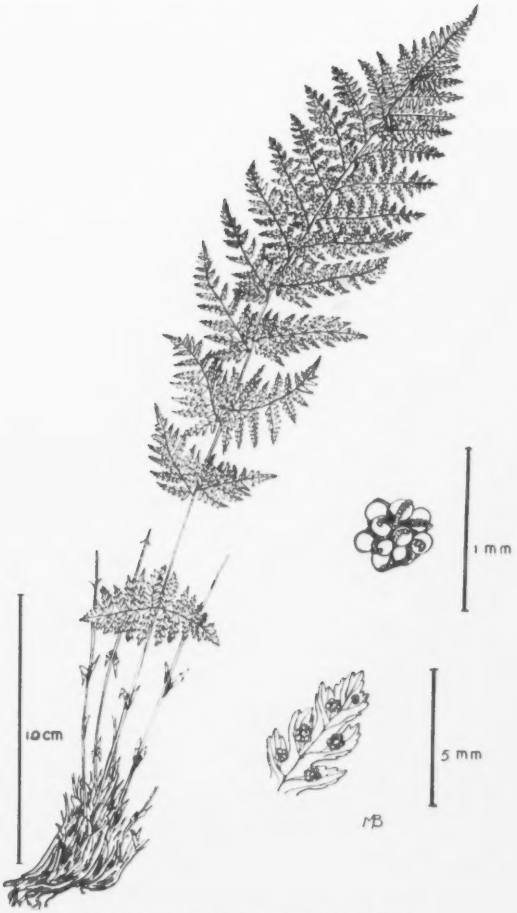
Medium- to large-sized ferns of erect habit; rhizome stout and short, forming a stipe-covered crown. Fronds herbaceous and soft, usually large, erect-spreading; stipes long to almost wanting. Blades ample, 1–3-pinnate, elongate; pinnules variously pinnately incised, membranous. Sori oblique to the mid-vein, narrowly oblong, either along one side of a veinlet or curving and crossing it to become somewhat horse-shoe shaped. Indusia thin, straight or curved, laterally attached, the free edge usually toothed, sometimes minute or obsolete.

A large genus, mainly of tropical regions. (Name from the Greek *athyros*, literally shieldless or without a door, perhaps with reference to the growth of the sporangia forcing back the indusium.)

Blades much dissected, almost skeleton-like, segments very narrow and distant; sori roundish; indusia obsolete or wanting ..... *A. alpestre*
Blades ample, leaf-like, segments broad and close; indusia and sori mostly crescent-shaped or broadly hooked ..... *A. filix-femina*

Athyrium alpestre (Hoppe) Rylands. Alpine Lady-fern

Rhizome very stout, erect or somewhat decumbent, branching, forming large round clumps, copiously covered with brown scales and coarse stipe-bases. Fronds numerous in a vase-like arrangement at the end of the rhizome, 20–80 cm. tall; stipe short, sparsely scaly, dark-straw coloured from a darker base. Blades glabrous, subcoriaceous, linear to oblong-lanceolate, acuminate, 18–70 cm. long, 4–28 cm. broad, usually 2-pinnate-pinnatifid, mostly one-quarter to one-third as broad as long. Pinnæ oblique, rather narrowly deltoid, gradually acuminate, the lower ones distant, sometimes shorter. Pinnules thin, stalked, somewhat oblique, broadest at the base, oblong-lanceolate to narrowly triangular, incised, the larger ones deeply pinnatifid. Sori numerous, very small, round; indusia not evident, rudimentary or lacking. (*Phegopteris alpestris* (Hoppe) Mett., *Athyrium americanum* (Butters) (Maxon.)



Athyrium alpestre (Hoppe) Rylands.
Alpine lady-fern.

Habitat.—Wet talus slopes, rocky hillsides and alpine meadows.

Range.—South-eastern Alaska, s. to Calif., Nev., and Colo.; Gaspé Pen., Que.; Nfld.; Iceland; Eurasia.

Comments.—At fairly high altitudes in the southern Cascades, Selkirks, and the mountains of Vancouver Island; not uncommon. This widely ranging alpine species occurs in several geographic varieties. The American form has been named var. *americanum* Butters.

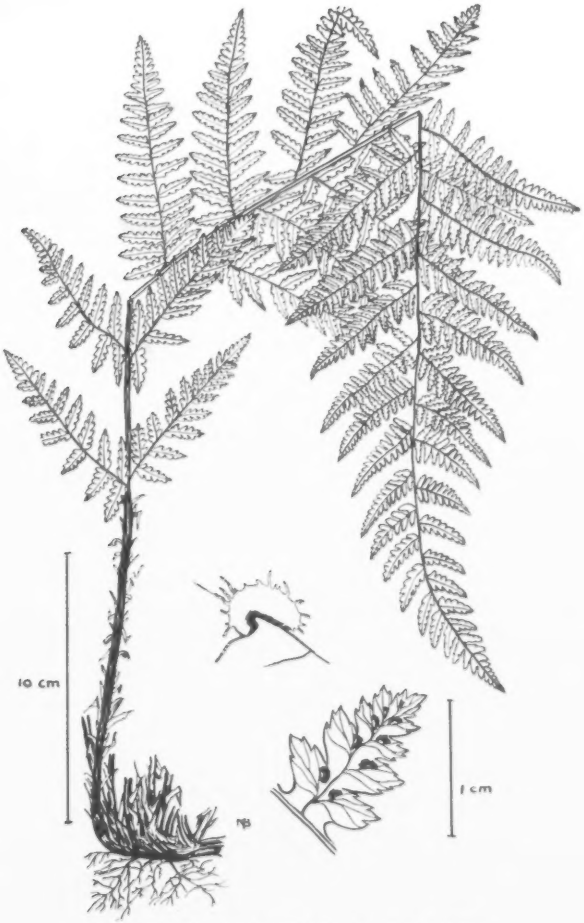
Athyrium filix-femina (L.) Roth. Lady-fern

Rhizome stout, erect or ascending, terminating in a tuft of fronds, chaffy, with numerous thin, lanceolate, light- to dark-brown scales. Fronds up to 2 m. tall, erect-spreading; stipes short, fragile, furrowed, straw-coloured, scaly at the dark base. Blades narrowly to broadly lanceolate, tapering both ways from about the middle, 2–3-pinnate. Pinnæ linear to lanceolate-oblong, acuminate to attenuate, practically sessile, obliquely spreading, the lower ones increasingly more separated. Pinnules thin, crenate, variously incised, even pinnate, sessile, often decurrent on the narrowly winged rachis, glabrous. Sori oblong to lunate or horse-shoe shaped; indusia similar, laterally attached to their inner side to a veinlet, often toothed, septate-ciliate. (*Asplenium cyclosorum* Rupr.)

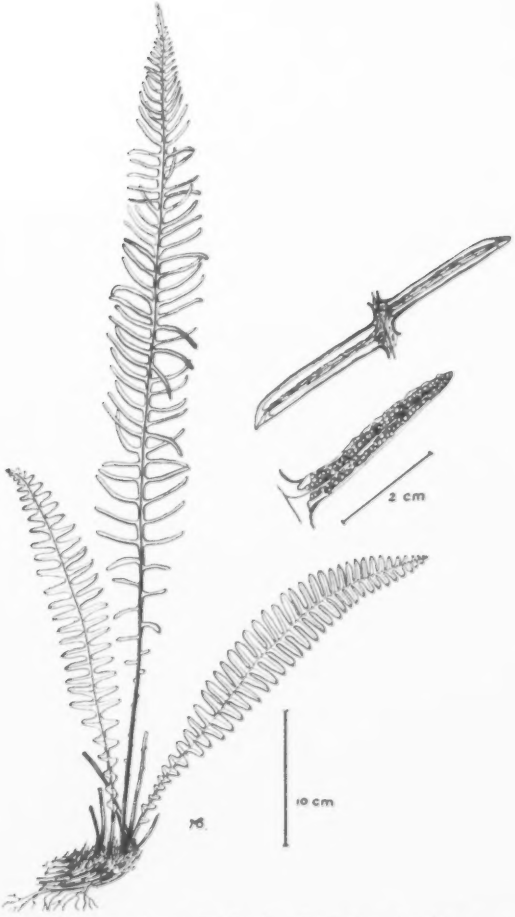
Habitat.—Forests and damp shady places generally.

Range.—Alaska to Nfld., s. to Calif., Tex., and Fla.; Eurasia.

Comments.—To be expected anywhere in the Province where conditions are suitable for its growth. A variable and wide-ranging species that in one form or another is found throughout the Northern Hemisphere and on tropical mountains. Recent opinion recognizes a number of geographical varieties within the species complex. One of these is var. *sitchense* Rupr., found generally from the Aleutian Islands south to California and sporadically inland. This large, coarse variety is characterized by being about 2 m. tall, the fronds subcoriaceous, and the ultimate segments with broad, blunt teeth. An immature form (forma *hillii* (Gilbert)



Athyrium filix-femina (L.) Roth. Lady-fern.



Blechnum spicant (L.) Roth. Deer-fern, hard-fern.

Butters) with blunt and rounded, crowded pinnules, not at all pinnatifid, is not uncommon.

BLECHNUM L.

Chiefly forest ferns of various habits, terrestrial or epiphytic. Rhizomes woody, climbing, short-creeping, or erect and trunk-like in some tropical species. Fronds spreading or ascending, sometimes of two kinds; blades pinnatifid or pinnate. Sori continuous, parallel to the midrib and near the margin of the segment; indusia membranous, attached to the margin and opening toward the midrib, entire or lacerate, often reflexed at maturity. (*Struthiopteris* Scop., *Lomaria* Willd.)

A large genus of tropical and mainly south temperate distribution. Only one species occurs in Canada.

Blechnum spicant (L.) Roth. Deer-fern, Hard-fern

Rhizome short-creeping, woody, with narrow chestnut-coloured scales. Fronds of two kinds; sterile fronds evergreen, coriaceous, numerous in a crown, spreading, up to 100 cm. long with yellowish to chestnut-brown stipes 2–28 cm. long. Blades linear-oblanceolate, up to 80 cm. long, 2–9 cm. broad, pinnatifid, but becoming pinnate at the long attenuate base, basal segments broader, often distant. Segments very numerous, mostly linear to linear-oblong, somewhat roundish at the apex though the actual tip is often acute, entire or crenulate, glabrous, somewhat paler beneath. Fertile fronds deciduous, less numerous, arising from the centre of the crown, erect, up to 125 cm. tall; stipes dark-chestnut coloured. Blades similar to the sterile ones in general outline, pinnate, with many much-reduced basal segments; pinnæ distant, mostly narrowly linear, somewhat dilated at the base; sori continuous, parallel to mid-vein; indusia membranous. (*Struthiopteris spicant* (L.) Scop.)

Habitat.—Damp, mostly coniferous forests.

Range.—Alaska to Calif.; Eurasia.

Comments.—Very common west of the coastal mountains; also at Revelstoke.

CHEILANTHES Sw. Lip-ferns

Mostly small rock-loving ferns of dry regions. Fronds 1–4-pinnate, variously pubescent or glabrous; segments usually very small and bead-like. Sori borne at the enlarged tips of veins, solitary on minute lobes, or numerous and confluent. Indusia formed of the revolute, more or less modified margin of the lobes or segments, or in some species the margin closely reflexed or pouch-like, giving rise to a proper inward-opening indusium.

About 125 species of dry temperate and tropical regions. (Name from the Greek *cheilos* (margin) and *anthos* (flower), referring to the marginal sori.)

Blades variously scaly or pubescent; indusia formed of the scarcely modified, recurved or reflexed tip or border of the lobes or segments.
Fronds conspicuously long pubescent, scaly, even to the stipe ..... *C. feei*
Fronds not conspicuously pubescent, upper side of the blade glabrous, stipe soon glabrous ..... *C. gracillima*
Blades glabrous and naked; indusia narrowly linear, joined continuously to the closely reflexed margin ..... *C. siliquosa*

Cheilanthes feei Moore. Slender Lip-fern

Rhizome with several crowns, short-creeping or ascending, cespitose; scales narrow, cinnamon or darker brown with a distinct central blackish stripe. Fronds erect, somewhat flexuose, tufted, 8–25 cm. tall; stipes 3–13 cm. long, slender, dark brown, deciduously soft hairy. Blades linear-oblong to ovate, acuminate, 5–13 cm. long, 1.5–3.5 cm. broad, usually 3-pinnate. Pinnæ oblique, deltoid to ovate-oblong, thinly villous above with soft whitish hairs, densely and coarsely tomentose beneath with pale brown hairs, also on the rachis; ultimate segments roundish, simple or crenately lobed or divided.

Habitat.—Dry crevices of limestone cliffs.

Range.—Southern B.C. to w. Wis., s. to Calif., Tex., and Ark.

Comments.—In British Columbia this woolly little fern is known with certainty only from the cliffs above Fairmont Hot Springs and the walls of Marble Canyon.

Cheilanthes feei Moore. Slender lip-fern.

Cheilanthes gracillima D. C. Eaton. Lace-fern.

***Cheilanthes gracillima* D. C. Eaton. Lace-fern**

Rhizomes tufted with numerous, very scaly, short branches; scales rather dark brown, needle-like or slightly broader. Fronds very numerous, 8–24 cm. tall, more or less erect; stipes 15 cm. long, dark brown, soon naked or nearly so. Blades linear to oblong-lanceolate, 4–13 cm. long, 2-pinnate; lower pinnæ lance-oblong, pinnately divided, progressively less divided upwards. Rachis appressed scaly; segments oblong to oval, dull green, densely cinnamon tomentose beneath, a few minute stellate hairs above; margins deeply recurved.

Habitat.—Exposed crevices in cliffs and ledges of igneous rocks.

Range.—Southern B.C. to Idaho and Mont., s. to Calif. and Nev.

Comments.—Apparently restricted to the Cascades and south-eastern Vancouver Island.

***Cheilanthes siliquosa* Maxon. Indian's Dream**

Rhizome with several crowns, cespitose, scales abundant, very narrow, dark chestnut-brown. Fronds erect, densely tufted, 7–30 cm. tall; stipes 5–22 cm. long, dark chestnut-brown, stout, glabrous, lustrous. Blades broadly ovate, deltoid-oblong or somewhat pentagonal, 1.5–8.0 cm. long, 3-pinnate at least below, glabrous, mostly fertile. Pinnæ few, close together, definitely oblique, the basal broadly triangular, inequilateral, the lower pinnæ longest. Segments narrowly linear, 5–15 mm. long, mucronate; margins sharply revolute bearing a thin, continuous, erose-denticulate indusium. Sterile fronds with broader segments, margins callous, serrate. (*Pellæa densa* (Brack.) Hook.)

Habitat.—Exposed talus slopes and crevices of calcareous or serpentine rocks.

Range.—Southern B.C. to Calif., e. to n. Mont., Wyo., and Utah; Gaspé Pen., Que.

Comments.—Apparently restricted to the extreme southern parts of the Province where it is locally fairly common. Sicamous seems to be its most northerly station.

Cheilanthes siliquosa Maxon. Indian's dream.

CRYPTOGRAMMA R. Br. Rock-brake

Fronds evergreen, markedly dimorphic, numerous, densly clustered from the erect or somewhat creeping rhizome, not articulated at the base. Sterile fronds thin, membranous, spreading, glabrous. Fertile fronds longer than the sterile, segments narrow, entire, margins revolute forming a false indusium, true indusium not developed.

A very small genus of delicate, boreal or alpine ferns of rocky situations.

Rhizome relatively stout, ascending; fronds numerous, clustered, blades thick and opaque ..... *C. crispa*

Rhizome quite slender, creeping; fronds fewer, scattered, blades thin and membranous ..... *C. stelleri*

Cryptogramma crispa (L.) R. Br. Parsley Fern

Rhizomes short-creeping but mostly ascending, forming quite large tufts, chaffy; scales lance-ovate, attenuate, entire, brown with a darker central portion. Fronds very numerous, densely clustered, glabrous, markedly dimorphic. Sterile fronds spreading, 3–15 cm. long, stipe straw-coloured, scaly at base, blade ovate or ovate-lanceolate, 2-pinnate-pinnatifid, rachis compressed, greenish pinnæ alternate or the lower subopposite, few, short-petioled; ultimate segments ovate, oblong or obovate, obtuse, crenate or incised, thick, opaque. Fertile fronds stiffly upright, simpler, segments fewer, linear-oblong, 6–12 mm. long, 2 mm. broad, entire, the thin yellowish margins revolute. Sori scattered, soon confluent. (*C. acrostichoides* R. Br.)

Habitat.—Rock crevices and ledges, talus slopes.

Range.—Alaska s. in the mtns. to s. Calif. and N.M., local in the region of upper Great Lakes, Que., and Lab.; Eurasia.

Comments.—Common throughout the Province, particularly on talus slopes. The American form (var. *acrostichoides* (R. Br.) C. B. Clarke) differs from the Eurasian in having sterile fronds of a thicker texture and scales with a darker centre.

Cryptogramma crispa (L.) R. Br. Parsley fern.

Cryptogramma stelleri (Gmel.) Prantl. Slender cliff-brake.

***Cryptogramma stelleri* (Gmel.) Prantl. Slender Cliff-brake**

Rhizome very slender, cord-like, creeping, scaly and pilose. Fronds few, scattered, glabrous, dimorphic, drooping, the fertile ones longer than the sterile. Sterile fronds 7–15 cm. long, stipe almost chaffless, slender, usually longer than the blade, yellowish-green above, chestnut-brown below; blade ovate or oblong-ovate, 2-pinnate, the rachis green. Pinnæ few, membranous, the larger ones with pinnately divided basal pinnules; ultimate segments ovate to obovate, cuneate, crenate, petiolulate. Fertile fronds longer than the sterile, stipe longer than the blade, the blades 2–3-pinnate, segments linear-oblong to lanceolate, mostly acute, rather widely separated, entire. Sori marginal, continuous, false indusium formed by the delicately membranous, translucent, revolute margin.

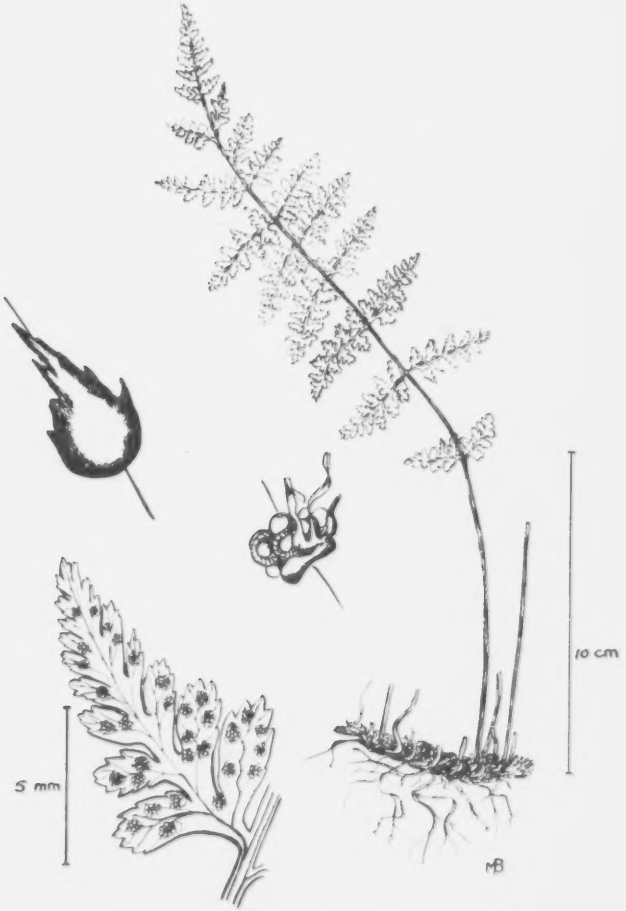
Habitat.—Moist, shaded, usually calcareous, rock crevices or cliffs.

Range.—Alaska to se. Lab. and Nfld., s. to Wash., Utah, Colo., ne. Iowa, n. Ill., Mich., n. Pa., and W. Va.; Asia.

Comments.—Known from several places in the Rockies from Banff southward, and erractically in the northern part of the Province. A very attractive, delicate little fern that is easily overlooked.

CYSTOPTERIS Bernh. Bladder-fern

Delicate woodland or damp rock ferns with finely divided pinnate fronds. Rhizomes creeping, scaly. Fronds erect, remote or somewhat tufted, stipes straw-coloured, scaly only at the base, not jointed to the rhizome. Blades glabrous or with a few scattered, septate hairs on the rachis, thin and delicate, 1–4-pinnate. Sori dorsal on free, simple or forked veins, roundish, separate. Indusium very delicate, membranous, hood-like or arched, attached by a broad base on the side toward the midrib so partly under the sorus, soon thrown back and withering away. Spores echinate or rugose.



Cystopteris fragilis (L.) Bernh. Fragile fern.

About a dozen species are recognized, mostly from temperate and boreal regions.

Fronds lanceolate or lance-oblong, tufted; rhizome thickish, unbranched ..... *C. fragilis*
Fronds deltoid-ovate, distant; rhizome slender, branched ..... *C. montana*

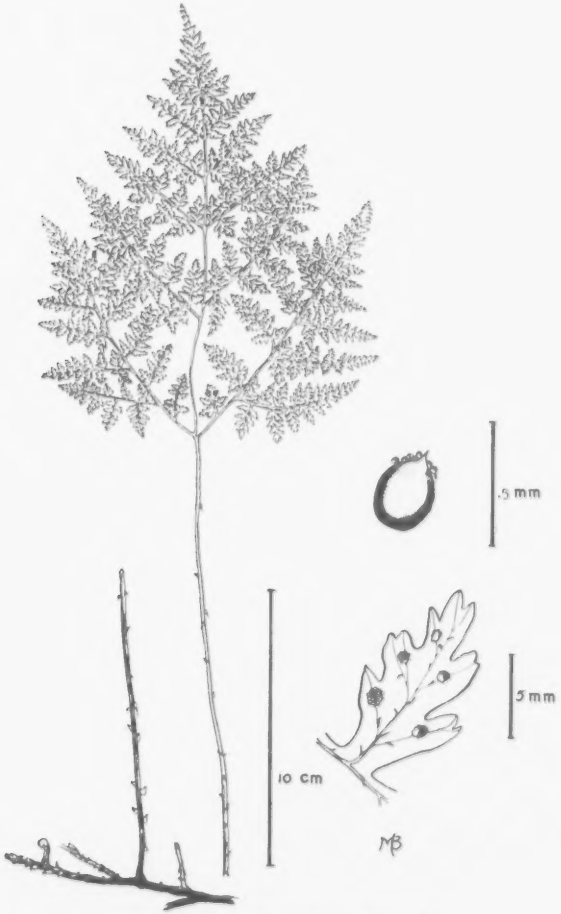
Cystopteris fragilis (L.) Bernh. Fragile Fern

Rhizome light brown, creeping, thickish, unbranched, scaly toward the apex; scales light brown, ovate, attenuate, entire. Fronds up to 30 cm. tall, erect-spreading, usually clustered. Stipe shorter than the blade, slender, glabrous, straw-coloured to light chestnut. Blades very variable, bright green, lanceolate to lance-ovate, 2–3-pinnate, rachis green except for a few hairs at base of the pinnæ. Pinnæ deltoid to deltoid-oblong, mostly acutish, petiolulate, the lowermost pair somewhat shorter than the second and rather distant from it. Pinnules spreading, ovate to oblong-lanceolate, incised, decurrent on the margined rachis, membranous. Sori rather small, often numerous and even coalescing, indusium thin and fragile, deeply convex, tapering toward the apex, free and often somewhat lacerate toothed or lobed.

Habitat.—Damp shady woods, rocky slopes and crevices in circumneutral soil.

Range.—Alaska to Lab., and Nfld., s. to s. Calif., Tex., Mo., n. Ill., n. Ohio, and mtns. of Va.; Eurasia; on mountains in the tropics and the Southern Hemisphere.

Comments.—Found very commonly throughout our area wherever suitable conditions are present. It is extremely variable in the size and shape of its fronds, yet all are best placed in the var. *fragilis*. In eastern North America certain variations are sufficiently consistent to warrant special names. One variant of special interest in the West has rugose rather than finely echinate spores. In this respect it comes close to the European *C. dickieana* Sim, but it does not have the foliage characteristic of that species. Further study is required to determine the proper status of this interesting form.



Cystopteris montana (Lam.) Bernh.
Mountain bladder-fern.

***Cystopteris montana* (Lam.) Bernh. Mountain Bladder-fern**

Rhizome black, slender, cord-like, long, widely creeping and branching; scales conspicuous, brown, ovate, acuminate, denticulate. Fronds few, scattered, arising singly from the spreading rhizome. Stipes dark brown at the base, pale above, considerably longer than the blades, sparingly glandular with a few septate hairs. Blade deltoid, somewhat ternate, up to 16 cm. wide and long, sparsely glandular beneath, 3-pinnate below, progressively less compound upwards, the lowermost basal pinnule of each pinna the largest, ultimate segments ovate, rounded often somewhat cleft at the apex. Indusia whitish, roundish irregularly toothed, not conspicuous.

Habitat.—Damp woods and calcareous or basic, rocky slopes.

Range.—Alaska to Greenland, s. to B.C., Colo., n. shore of Lake Superior, and Gaspé Co., Que.; Eurasia.

Comments.—Limited by its preference for alkaline soil conditions to a few localities in the Province, notably in the southern Rockies, the Selkirks, Barkerville, Dease Lake; also in the Yukon. This very attractive fern with its delicately compound frond is most distinctive in appearance.

DRYOPTERIS Adans. Shield-fern, Wood-fern

Mainly woodland ferns of upright habit. Rhizomes stout, short-creeping, erect and copiously chaffy. Fronds borne in a crown; fertile and sterile blades usually alike (except in *D. cristata*), 1–3-pinnate, glabrous or glandular or variously pubescent, conspicuously chaffy only in a few species. Sori mostly roundish, dorsal, the indusium (in ours) roundish-reniform, largish, persistent, attached at its sinus, glabrous or sometimes glandular. (*Aspidium* Sw.)

This very large, mainly tropical, woodland genus has been variously treated by different authorities. The modern tendency is to break it up into a number of smaller genera.

a. Blades subtripinnate, triangular, widest at or near the base; the lower pinnæ strongly unequal-sided ..... *D. austriaca*
aa. Blades pinnate-pinnatifid, not triangular, widest at or near the middle; lower pinnæ about equal-sided.
b. Blades freely capitate-glandular; indusia glandular-margined; blades narrow, about 5 cm. wide, aromatic ..... *D. fragrans*
bb. Blades and indusia glandless; blades wider, not aromatic.
c. Fronds strongly dimorphic, the fertile much taller and narrower than the sterile; pinnæ markedly reduced toward the base ..... *D. cristata*
cc. Fronds essentially alike; pinnæ not reduced toward the base.
Pinnæ subsessile, oblong-lanceolate; the lower basal pinnule semicordate, usually overlying the main rachis; veinlets spreading, all ending in salient, spine-like teeth ..... *D. arguta*
Pinnæ clearly stalked, deltoid-lanceolate; basal pinnule symmetrical; veinlets oblique, ending in oblique, usually curved, acute teeth ..... *D. filix-mas*

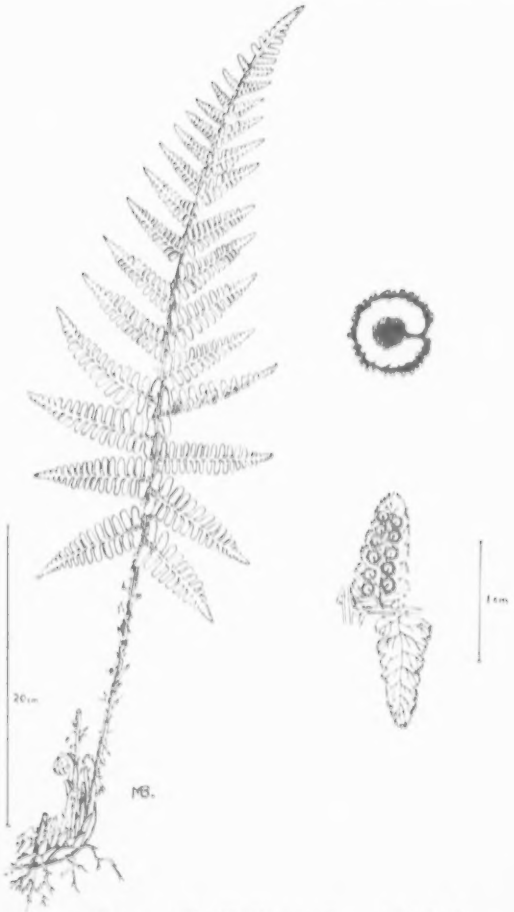
Dryopteris arguta (Kaulf.) Watt. Coastal Shield-fern

Rhizome stout, short-creeping, covered by abundant bright chestnut-coloured scales. Fronds evergreen, tufted, 2-pinnate, ovate to deltoid-lanceolate, acuminate, subcoriaceous, 25–70 cm. tall. Stipe stout, up to one-half the length of the blade, scaly. Blade 10–35 cm. broad, widest at or near the base. Pinnæ spreading, oblong-lanceolate, long-acuminate, the lower ones broadest. Pinnules somewhat distant, oblong, mostly rounded-obtuse, 2-serrate to pinnately incised; veinlets spreading, all ending in salient, often cartilagenous, spine-like teeth. Sori large; indusia pale greenish-yellow, orbicular, firm, persistent, flat to somewhat concave with a deep narrow sinus, glabrous but with somewhat glandular margins. (*D. rigida* Gray var. *arguta* (Kaulf.) Underw., *Aspidium rigidum* of Henry.)

Habitat.—Rocky ledges and woods along the coast.

Range.—Southern B.C. to Calif., locally inland to Ariz.

Comments.—Apparently limited to the south-east coast of Vancouver Island and the islands of the Gulf of Georgia. Specimens have been seen from Hornby Island (*Connell*) and Nanaimo (*Taylor*). Henry's report of its occurrence on Mount Finlayson,



Dryopteris arguta (Kaulf.) Watt. Coastal shield-fern.

Saanich Peninsula, is not supported by any known specimen but is not improbable.

***Dryopteris austriaca* (Jacq.) Woynar. Spiny Wood-fern**

Rhizomes stout, erect or ascending, chaffy. Fronds 3–10 dm. tall, spreading, borne in a crown, deciduous or subpersistent. Stipes 15–45 cm. long, usually shorter than the blade, clothed with brownish, often darker-centred, scales. Blades broadly triangular to ovate or broadly oblong, acuminate, 15–90 cm. long, 10–40 cm. broad, nearly or quite 3-pinnate. Basal pinnæ broadly ovate or triangular, inequilateral, the upper ones lanceolate; margins of pinnules or lobes serrate, teeth mucronate, straight or falcate, appressed. Indusium glabrous sometimes glandular. (*Aspidium spinulosum* Sw. var. *dilatatum* (Hoffm.) Hook., *Dryopteris dilatata* (Hoffm.) A. Gray, *D. spinulosa* (O. F. Muell.) Watt var. *americana* (Fisch.) Fern.)

Habitat.—Cool, moist woods.

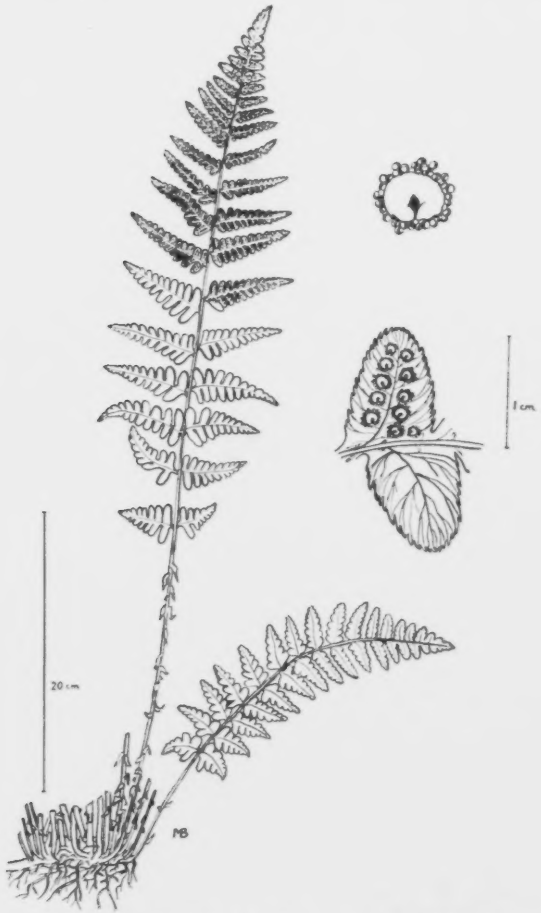
Range.—Southern Alaska to Nfld., s. to Calif., Mont., and N.E., and in the mtns. of N.C. and Tenn.; Greenland; Eurasia.

Comments.—One of our commonest and most widespread ferns. This highly variable species is found in one or other of its geographical varieties over the entire forested area of the Northern Hemisphere. In our region it is represented very largely by var. *austriaca*, characterized in particular by the basal pinnæ, the basal pinnules of which are 5–15 mm. apart and the lower pinnule usually considerably more than twice as long as the one above it. Collections from Kispiox in the Skeena Valley (*Eastham*) and Eaglet Lake (*Taylor* and *Lewis*) are perhaps best referred to the eastern American var. *spinulosa* (Muell.) Fiori.

***Dryopteris cristata* (L.) A. Gray. Crested Shield-fern**

Rhizome stout, decumbent or somewhat creeping, heavily covered with old stipe bases. Fronds of two kinds; the sterile, evergreen, shorter and laxer than the erect, deciduous, fertile frond. Stipes up to 50 cm. long, with thin, ovate, uniformly coloured, cin-

Dryopteris austriaca (Jacq.) Woyner.
Spiny wood-fern.



Dryopteris cristata (L.) A. Gray. Crested shield-fern.

namon or pale brown scales. Blades glabrous, linear to lance-oblong, somewhat narrowed at the base, pinnate-pinnatifid. Pinnæ on fertile fronds often twisted on the rachis to lie more or less horizontal, lower pinnæ deltoid, the upper deltoid-oblong, mostly obtusish, deeply cut into deltoid-oblong, obtuse, appressed-serrate lobes, the inner basal segment of the lowest pinnæ obviously longer than the second. Sori more or less median; indusia round-reniform, glabrous, persistent. (*Aspidium cristatum* (L.) Sw.)

Habitat.—Marshes, bogs, and swampy thickets.

Range.—South-eastern B.C. to Nfld., s. to Idaho, Mont., Neb., Ark., and Va.; Europe.

Comments.—This distinctive fern is very rare and local in its distribution with us, being limited to the Columbia and Kootenay Valleys, where it has been collected in the vicinity of Revelstoke and Kitchener.

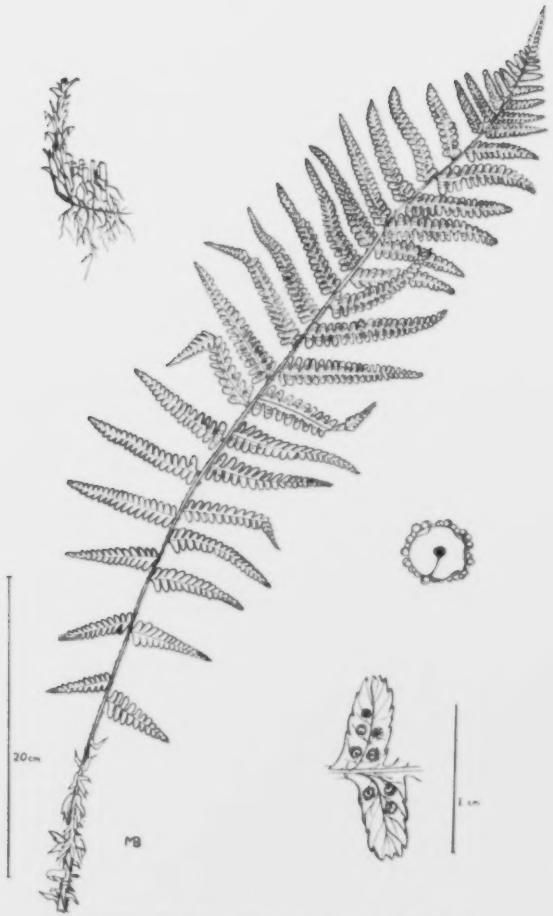
Dryopteris filix-mas (L.) Schott. Male-fern

Rhizome stout, ascending, covered with long scales. Stipes stout, comparatively short, 2–15 cm. long, densely covered by lance-linear, pale-brown scales. Fronds erect, deciduous, lanceolate to lance-oblong, slightly narrowed toward the base and gradually acuminate upwards, pinnate-pinnatifid to almost 2-pinnate. Pinnæ lance-linear to ovate-lanceolate, sharply acuminate, more or less petioled, the lower shorter, with crenate or serrate, obtuse, oblong segments or pinnules, glandless but with rachis and midrib bearing narrow, strongly toothed scales. Sori midway between the margin and the mid-vein, mostly confined to the upper half of the frond. Indusia orbicular-reniform, firm, persistent, brown to pale brown, sinus prominent. (*Aspidium filix-mas* (L.) Sw.)

Habitat.—Rocky woods and shaded talus slopes.

Range.—B.C. to Nfld., s. to Calif., Tex., Okla., and to Vt.; Greenland; Iceland; Eurasia.

Comments.—Despite the great extent of its range, this species shows surprisingly little variation in appearance. With us it is



Dryopteris filix-mas (L.) Schott. Male-fern.

sporadic in the coastal mountains as far north as the Nass River, and in the Selkirk Mountains.

***Dryopteris fragrans* (L.) Schott. Fragrant Shield-fern**

Rhizome short and stout, erect, covered by many persistent, curled, old fronds. Fronds spreading, evergreen. Stipes short, up to 13 cm. long, glandular, densely clothed with lustrous brown or reddish, often glandular-puberulent, ovate-lanceolate scales. Blades coriaceous, pinnate-pinnatifid, linear-lanceolate or broadly linear, tapering both ways from the middle, the lowest pinnæ very much reduced. Pinnæ oblong-lanceolate, obtuse, pinnately crenate or incised, not spinulose, often overlapping and inrolled, glandular, persistently scaly below. Sori medial; indusia large, whitish becoming brown with age, densely crowded, often overlapping, persistent, glandular-margined.

Habitat.—Shaded or exposed cliffs of basic, usually calcareous, rocks.

Range.—Alaska to Nfld., s. to n. B.C., Minn., Wis., Mich., ne. N.Y., and n. N.E.; Eurasia.

Comments.—Very rare in British Columbia, known only from Atlin and Mount Selwyn in the northern Rocky Mountains. The persistence of the curled-up old fronds, the marked scaliness of the fronds, and their sweet sickly aroma when fresh are all useful diagnostic characters.

GYMNOCARPIUM Newm. Oak-fern

Rhizomes long-creeping, branched, sparsely scaly with uniformly coloured, glabrous, entire scales. Fronds scattered, arising singly from the rhizome, membranous, thin, deciduous. Stipes straw-coloured with a darker base, slender, longer than the blades. Blades deltoid pentagonal, ternately compound, the lower pinnæ articulated at the base, long petioled, inequilateral, glabrous and scaleless, sometimes glandular. Sori essentially circular, indusium lacking.

Dryopteris fragrans (L.) Schott. Fragrant shield-fern.

About three species of north temperate woodlands and shaded rocky slopes.

Rachis and blades glandless or nearly so; first pinnule on the lower side of the basal pinnæ about one-third as long as the main rachis or longer; pinnules acutish; margins not recurved ..... *G. dryopteris*

Rachis and blades densely glandular; first pinnule on the lower side of the basal pinnæ about one-fourth as long as the main rachis or shorter; pinnules obtuse; margins often recurved ..... *G. robertiana*

Gymnocarpium dryopteris (L.) Newm. Oak-fern

Rhizome slender, wide-creeping, bearing a few thin pale-brownish scales. Fronds somewhat distant in rows, erect, up to 40 cm. tall, deciduous. Stipes slender, lustrous, straw-coloured, glabrous or sometimes with a few papery scales, arising from a chaffy base. Blade broadly triangular, ternately pinnate, glabrous, rarely glandular. Basal pinnæ deltoid, about equalling the rest of the frond in size, the petioles articulated to the rachis; ultimate segments oblong, obtuse, crenate to slightly pinnatifid, their margins not recurved. Sori small, circular, submarginal; indusia lacking. (*Phegopteris dryopteris* (L.) Fee, *Dryopteris linnæana* C. Chr., *D. disjuncta* (Rupr.) Morton, *Thelypteris dryopteris* (L.) Slosson.)

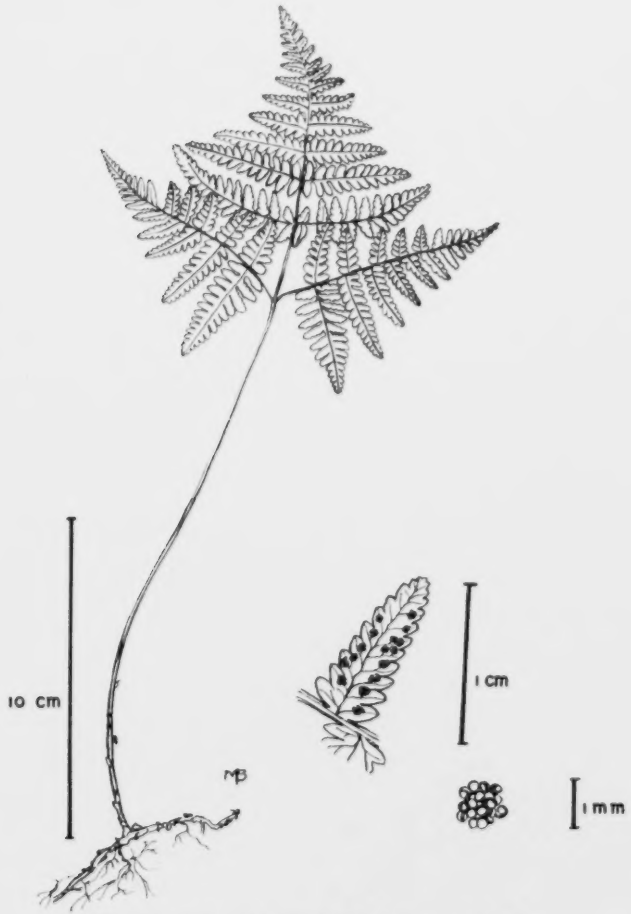
Habitat.—Damp woods, shaded rocky slopes and ledges, soil often subacid.

Range.—Circumboreal; Alaska to Nfld., s. to Ore., mtns. of e. Ariz., and N.M., n. Kan., W. Va., Pa.; Greenland; Iceland; Eurasia.

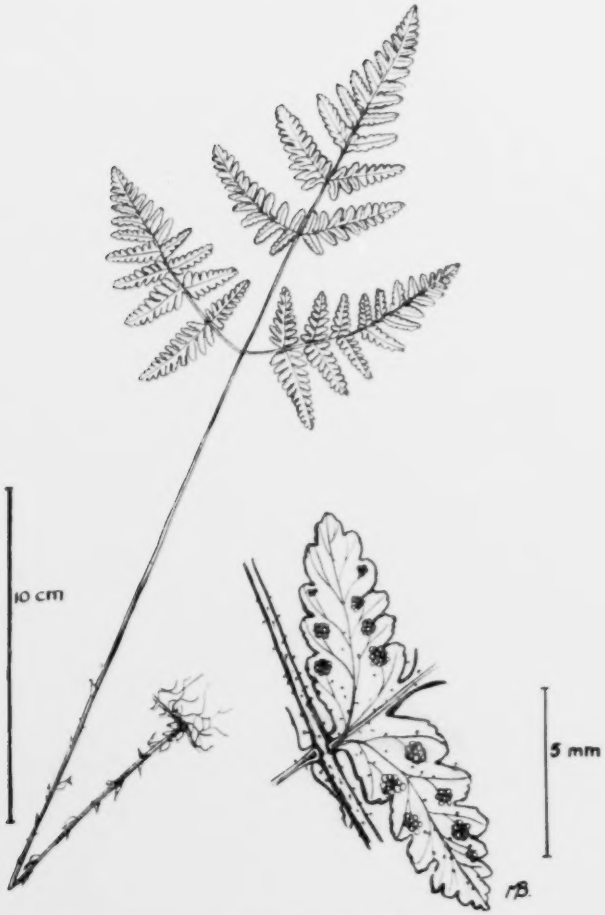
Comments.—Very common in suitable habitats throughout the Province.

Gymnocarpium robertianum (Hoffm.) Newm. Limestone Oak-fern

Rhizome slender, wide-creeping, somewhat scaly, scales ovate, pale brown, sparingly glandular. Fronds somewhat distant in rows, erect, up to 35 cm. tall, deciduous. Stipes up to 25 cm. long, yellowish, dull, minutely glandular-puberulent, sparsely scaly.



Gymnocarpium dryopteris (L.) Newm. Oak-fern.



Gymnocarpium robertianum (Hoffm.) Newm.
Limestone oak-fern.

Blade deltoid-ovate to narrowly deltoid, up to 15 cm. long and as broad at the base, minutely glandular-puberulent, 2-pinnate-pinnatifid. Pinnæ opposite, the lowest pair largest, narrowly deltoid, almost symmetrical, about one-fourth or less the length of the main rachis, their petioles articulated to the rachis. Pinnules sessile, ovate-oblong, obtuse. Ultimate segments oblong, about 10 mm. long, margins entire to somewhat crenate, often revolute. Sori small.

Habitat.—Limestone ledges and talus, cool, calcareous swamps.

Range.—Alaska to Nfld., s. to B.C., Idaho, Iowa, Ohio, Tenn., and N.C.; Eurasia.

Comments.—Very rare in British Columbia, known with certainty only along the Big Bend Highway. Quite similar to *G. dryopteris* but distinguishable by its relatively narrower frond, which is glandular on both sides.

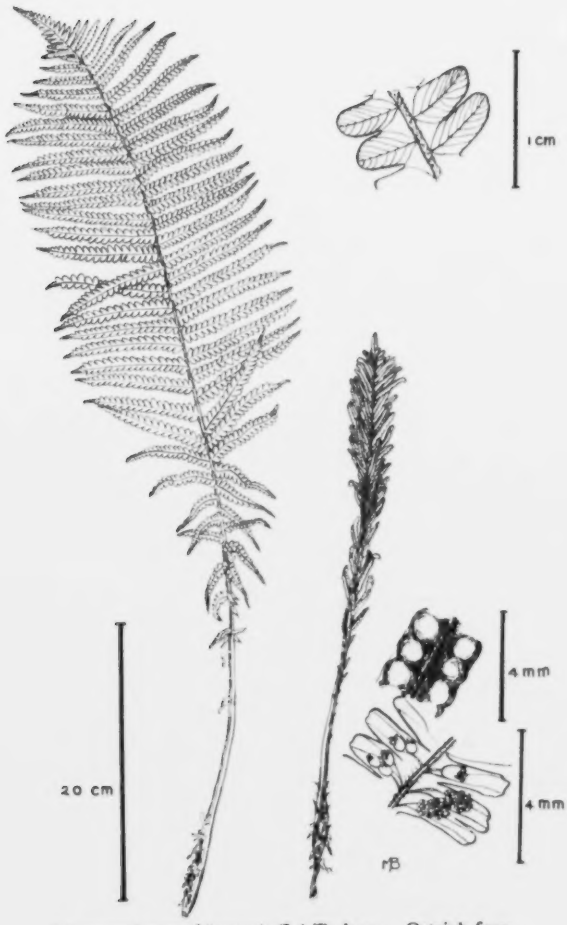
MATTEUCCIA Todaro. Ostrich Fern

Rhizome deeply subterranean, black, much branched, ending in an erect, stout caudex covered with thin brown scales. Fronds markedly dimorphic, the sterile, herbaceous, forming a vase-like arrangement in the centre of which develop the much shorter, dark, indurated fertile fronds. Stipes much shorter than the blades. Sterile blades pinnate-pinnatifid, fertile blades simply pinnate. Veins free. Sori elongated, several to a segment, covered by the more or less scarious, revolute margin of the frond; indusium hood-like, hyaline, soon withering. (Name commemorates Carlo Matteucci, 1800–68, an Italian physicist.)

A small genus of three species of coarse but decorative ferns found only in the Northern Hemisphere.

Matteuccia struthiopteris (L.) Todaro. Ostrich Fern

Caudex erect, covered by the bases of old stipes, stout, arising from a widely creeping and branching rhizome. Sterile fronds in a circle in a vase-like arrangement, up to 2 m. tall, pinnate-pinnatifid. Stipe short, green to black at the base, furrowed on the upper face,



Matteuccia struthiopteris (L.) Todaro. Ostrich fern.

chaffy when young with thin, papery, pale-brown scales. Blade broad, narrowly obovate-lanceolate, gradually narrowed toward the base, abruptly short-acuminate above; rachis furrowed above, narrowly wing-margined. Pinnæ spreading-ascending, long-acuminate, alternate, deeply pinnatifid into blunt, oblong segments with slightly revolute margins. Fertile fronds stiffly erect inside the circle of sterile fronds and considerably shorter. Stipe dark brown, about as long as the blade. Fertile blade olivaceous finally blackish with crowded, spreading-ascending pinnæ with pod-like segments. (*Onoclea struthiopteris* of Henry, *Pteretis nodulosa* (Michx.) Nieuwl., *P. pennsylvanica* (Willd.) Fern., *Struthiopteris filicastrum* All.)

Habitat.—Edge of swamps and rich bottom-land woods, particularly in circumneutral alluvial soil.

Range.—Alaska to Nfld., s. to B.C., S.D., Mo., Ill., Ind., Ohio, W. Va., n. Va., and N.E.; Europe.

Comments.—Locally common from Hazelton to Giscome and south to Quesnel, between Lumby and Revelstoke, and in the Lower Fraser Valley between Agassiz and Hope. The large size and the shape of both the sterile and fertile fronds are good characteristics. By some botanists the American plant is assigned to the var. *pennsylvanica* (Willd.) Morton, distinguishable by the scales on the stipe-base being uniformly coloured, lacking the dark central band of the European type.

PELLÆA Link. Cliff-brake

Small, stiff, rock ferns. Rhizome short and nodose or slender and creeping, scales linear-subulate, brown, attenuate. Fronds often much bunched, stiff, mostly erect, glabrous. Stipes wiry, dark and lustrous. Blades 1–3-pinnate, coriaceous, often subdimorphic, more or less glaucous. Segments linear to round-oval, more or less distinctly articulate. Sori without indusium, terminal or subterminal on the veinlets, usually laterally confluent and submarginal, protected by the reflexed or revolute, indusium-like margin.

About eighty species of dry temperate regions. (Name from the Greek *pellos* (dusky), alluding to the dark-coloured stipe.)

Stipes and rachises obviously hairy; lower fertile pinnæ mostly again pinnate, some of the upper pinnæ often with a superior auricle *P. atropurpurea*
Stipes and rachises essentially glabrous; lower pinnæ usually only trifoliate with adnate segments, none of the upper pinnæ with auricles as a rule *P. glabella*

Pellæa atropurpurea (L.) Link. Purple Cliff-brake

Rhizome short and stout with linear, rusty scales with hair-like tips. Fronds evergreen, stiffly erect, 8–30 cm. tall, subdimorphic, much bunched, mixed in with numerous persistent stipes. Stipes much shorter than the blades, dark purplish-brown, rigid, clothed in varying degrees by long, more or less appressed multicellular hairs. Blades coriaceous, glaucous, oblong or lance-oblong, up to 5 cm. broad, pinnate. Pinnæ glabrous, mostly simple, linear to linear-ovate or linear-lanceolate, distant, all but the upper ones stalked, lower pinnæ long-stalked, 3–5-lobed or divided, some of the upper ones with a superior auricle. Margins of fertile pinnæ strongly but narrowly recurved, the border thin, often membranous, irregularly repand-crenulate, forming a continuous, general indusium. (*P. occidentalis* (Nels.) Rydb.)

Habitat.—Dry crevices of limestone cliffs.

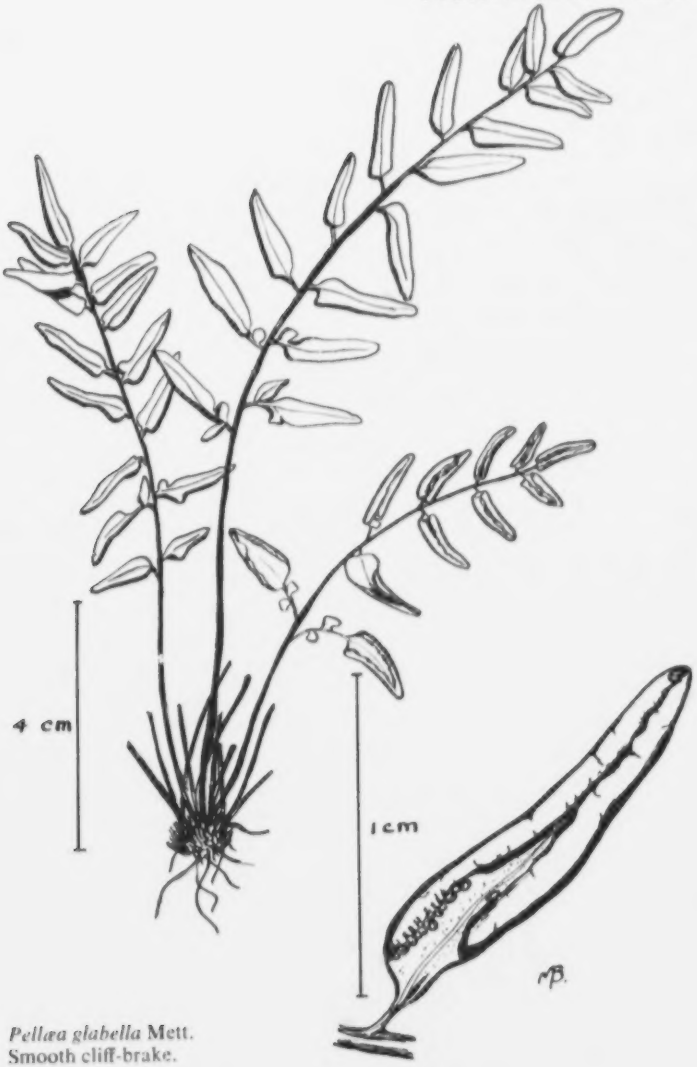
Range.—B.C. to Que., s. through Wash. to Ariz., e. through Ark. to Va.

Comments.—Known in British Columbia only from the Upper Columbia Valley from Columbia Lake to Kinbasket Mountain. Can be distinguished from *P. glabella* by its larger size, rough hairy stipe and rachis, and with many of the pinnæ themselves pinnate.

Pellæa glabella Mett. Smooth Cliff-brake

Rhizome short and stout with lanceolate brown scales lacking a long hair-tip. Fronds evergreen, stiff, either erect or spreading, usually not more than 25 cm. long, frequently much less, subdimorphic, numerous in tufts among persistent stipe-bases. Stipe wiry, smooth and lustrous or occasionally with sparse, spreading

Pellæa atropurpurea (L.) Link. Purple cliff-brake.



Pellæa glabella Mett.
Smooth cliff-brake.

hairs, dark-purplish, almost black. Blades coriaceous, glaucous, linear-ovate to lance-oblong, pinnate. Pinnæ subopposite, simple or the lowest divided into three lobes, none of the upper ones auriculate. Margins of fertile pinnæ abruptly recurved to form a thin, narrow, often membranous, continuous indusium.

Habitat.—Dry limestone crevices.

Range.—B.C. to Que., s. to Wash., Colo., Okla., Ark., Tenn., and Va.

Comments.—Specimens have been seen only from the vicinity of Canal Flats, Summerland, and Marble Canyon by Pavilion Lake. The small form that occurs in the Province is known as var. *simplex* Butters.

PITYROGRAMMA LINK.

Smallish ferns of dry hillsides, rock ledges, and crevices. Rhizome short-creeping, covered with stiff, dark scales. Fronds tufted, erect or drooping, all alike. Stipes not articulated to the rhizome, rather wiry, dark and glossy. Blades 1–3-pinnate, linear to deltoid-pentagonal in outline, usually without scales, sometimes glandular above, covered beneath by a conspicuous white to golden-yellow powder. Sori following the veinlets, often confluent, indusium absent. (Name from Greek *pityron* (bran) and *gramma* (letter or line), referring to the scaly linear sori.)

A genus of about fifteen species, mainly of tropical regions, only one of which occurs in the United States and Canada.

Pityrogramma triangularis (Kaulf.) Maxon. Golden-back Fern

Rhizome thickish, short-creeping or somewhat ascending; scales narrow, stiff, brownish, often black-keeled. Fronds erect, numerous, tufted, up to 35 cm. tall. Stipes stiff and wiry, very dark brown, lustrous, glabrous except at the base, about twice as long as the blade. Blades deltoid-pentagonal, pinnate, 2 basal pinnæ relatively large, pinnate or pinnately divided, deltoid but markedly asymmetrical about the mid-vein, the largest pinnules on

Pityrogramma triangularis (Kaulf.) Maxon.
Golden-back fern.

the lower side. Other pinnæ linear-oblong, pinnately lobed, segments rounded-obtuse, mostly decurrent, coriaceous, covered with white or yellowish waxy powder below, essentially glabrous above. Sori along the branched veins, confluent with age. (*Gymnogramma triangularis* Kaulf.)

Habitat.—Rocky slopes and crevices.

Range.—Vancouver Is., B.C. to n. Lower Calif., e. to Idaho and Nev.

Comments.—Known in British Columbia only from the dry south-eastern part of Vancouver Island from Nanaimo southward. In dry weather the fronds curl up, showing their characteristic light-coloured lower surface covered with yellowish or whitish powder.

POLYPODIUM L. Polypody

Rhizomes relatively slender, often wide-creeping, mostly quite scaly. Stipes short, distinctly articulated to the rhizome. Fronds evergreen or withering in dry seasons, all alike, scattered, pinnatifid to pinnate (in our species), segments alternate to subopposite, not reduced toward the base. Veins all 1- or 2-forked, sometimes anastomosing, not reaching the margin. Sori round, largish, each borne (in our species) at the end of a free veinlet; indusium always lacking. (Named from the Greek *polys* (many) and *pous* (foot), alluding to the numerous knob-like prominences on the rhizome.)

A very large genus of several hundred species of terrestrial or epiphytic ferns, mainly of tropical and sub-tropical regions.

Segments rigidly coriaceous, margins cartilagenous; sori very large, crowded against the mid-vein ..... *P. scouleri*
Segments membranous to herbaceous, margins not cartilagenous; sori smaller, midway between the margin and the mid-vein ..... *P. vulgare*

Polypodium scouleri Hook. and Grev. Leathery Polypody

Rhizome lacking licorice taste, creeping, woody, sparsely covered with dark scales, naked in age. Fronds few, 18–65 cm. tall, usually somewhat scattered. Stipes glabrous, stout, stiff, shorter than the blade. Blades deltoid-ovate, acute, up to 40 cm. long,

Polypodium scouleri Hook. and Grev.
Leathery polypody.

pinnate to pinnatifid. Pinnæ linear to linear-oblong, stiffly coriaceous, rounded at the apex; cartilagenous border crenate to obscurely crenate-serrulate; terminal pinna distinct, much longer than the upper lateral ones. Mid-vein prominent, deciduously scaly beneath, lateral veins forming a single series of nets. Sori very large, round, crowded against the mid-vein, mostly confined to the upper pinnæ.

Habitat.—Trees or rocks near the coast.

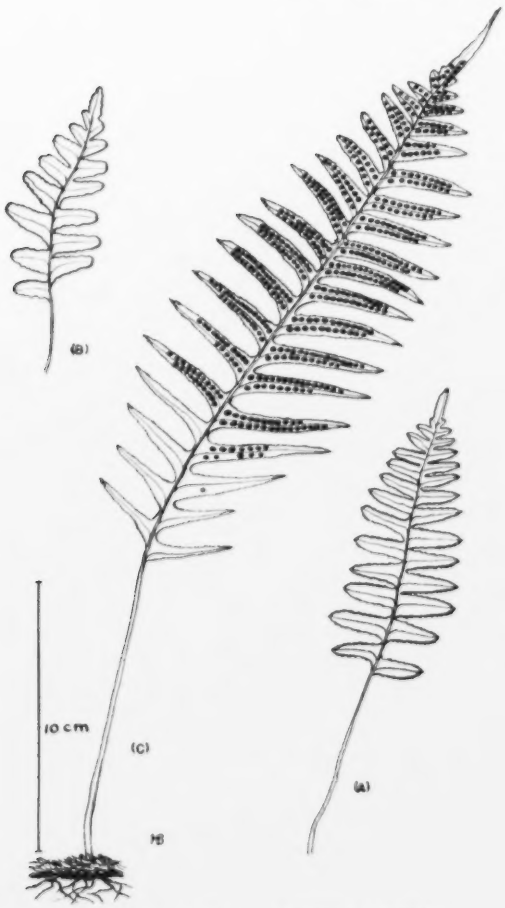
Range.—B.C. to Calif., Lower Calif.

Comments.—Apparently confined to the outer coast of the Province from the southern end of the Queen Charlotte Islands south to Lanz Island, and on the west coast of Vancouver Island, eastward nearly to Victoria. Not known from the mainland or the inner islands. This species is readily identified by the firm, leathery frond with broad blunt segments.

Polypodium vulgare L. Common Polypody, Licorice Fern

Rhizome with licorice taste, creeping, densely covered by pale-cinnamon to chestnut, uniformly coloured scales. Fronds somewhat scattered up to 75 cm. tall, ascending. Stipes firm, straw-coloured, glabrous, shorter than to fully as long as the blades. Blades up to 55 cm. long, deltoid-oblong, linear-oblong or lanceolate, pinnatifid nearly to the winged rachis. Segments spreading, varying from narrowly oblong to oval, elliptical or subspatulate to linear-attenuate, margins crenate, obscurely crenate-serrulate or curvescent-serrate. Veins free, 2- or 3-forked. Sori oval to round, conspicuous, about midway between the main vein and the margin.

Frond of firm texture; segments subacute to obtuse, never attenuate.
Pinnæ subacute to obtusish, oblong, crenate or minutely serrulate ..... var. *commune* Milde (A)
Pinnæ round-tipped, oblong-elliptic to narrowly obovate, obscurely to deeply crenate ..... var. *columbianum* Gilbert (B)
(*P. hesperium* Maxon)
Frond of thin texture; segments narrowly lanceolate, attenuate, finely serrate or serrate-dentate ..... var. *occidentale* Hook (C)
(*P. glycyrrhiza* D. C. Eaton)



Polypodium vulgare L. Common polypody, licorice fern.

Habitat.—Mossy rocks and slopes, tree-trunks.

Range.—Alaska to Calif., Lower Calif.; Eurasia; North Africa.

Comments.—A very variable species of wide range, by some American authors broken up into several species. Intergrades are so numerous, however, that this course seems hardly justified. In British Columbia the above varieties are fairly readily recognized as a rule. Whether they actually represent geographical varieties or not still remains to be determined. Of the above, var. *columbianum* is found throughout the Province, while the other two are restricted to the damper climates, particularly west of the Cascades.

POLYSTICHUM Roth.

Rather coarse ferns of woods and rocky places; rhizomes erect to decumbent, copiously chaffy. Fronds stiffly upright or recurved, sometimes more or less spreading, usually borne in a crown, in ours pinnate or 2-pinnately compound. Blades somewhat scaly and leathery in texture; pinnæ often unequal at the base, auriculate above, usually with serrate margins, teeth sharp to spinose, veins free. Sori circular; indusia round, centrally peltate.

A large genus mainly of boreal and temperate regions.

Blades simply pinnate, the pinnæ variously incised but never pinnately lobed or pinnatifid.

Stipes very short; pinnæ mostly oblong-lanceolate, the lower ones about as long as wide; teeth conspicuously spreading ..... *P. lonchitis*

Stipes much longer; pinnæ linear-attenuate, the basal ones at least 2–3 times as long as wide; teeth incurved ..... *P. munitum*

Blades 2-pinnate, or at least pinnately lobed or divided at the base.

Pinnæ pinnately lobed to pinnatifid at the base, deltoid-ovate to deltoid-oblong ..... *P. scopulinum*

Pinnæ nearly or quite pinnate, narrowly triangular.

Rachis with proliferous buds; basal pinnule on the upper side conspicuously longer than the next ..... *P. andersonii*

Rachis without proliferous buds; basal pinnule on the upper side of the pinnæ not conspicuously longer than the next ..... *P. braunii*

Polystichum andersonii Hopkins. Anderson's holly-fern.

Polystichum andersonii Hopkins. Anderson's Holly-fern

Rhizome very stout, ascending, sometimes assurgent, with numerous thin, pale-chestnut, linear to ovate, denticulate scales. Fronds 4–10 dm. tall, ascending in a crown. Stipes stout, 5–25 cm. long, grooved above, chaffy. Blades 2-pinnate, dark green above, densely chaffy on the rachis below, narrowly lance-oblong to lance-elliptic, long acuminate, 8–20 cm. broad; rachis grooved above, bearing a few chaffy buds near the tip. Pinnæ alternate, narrowly triangular, attenuate, finely scaly below, glabrate above, pinnately lobed or divided, pinnate below. Pinnules oblique, elliptical, decurrent, strongly serrate, the teeth long-awned; basal pinnule on the upper side of the pinnæ longer than the one next to it. Sori large, nearly midway between the mid-vein and the margin; indusia erose-dentate, teeth somewhat gland-tipped.

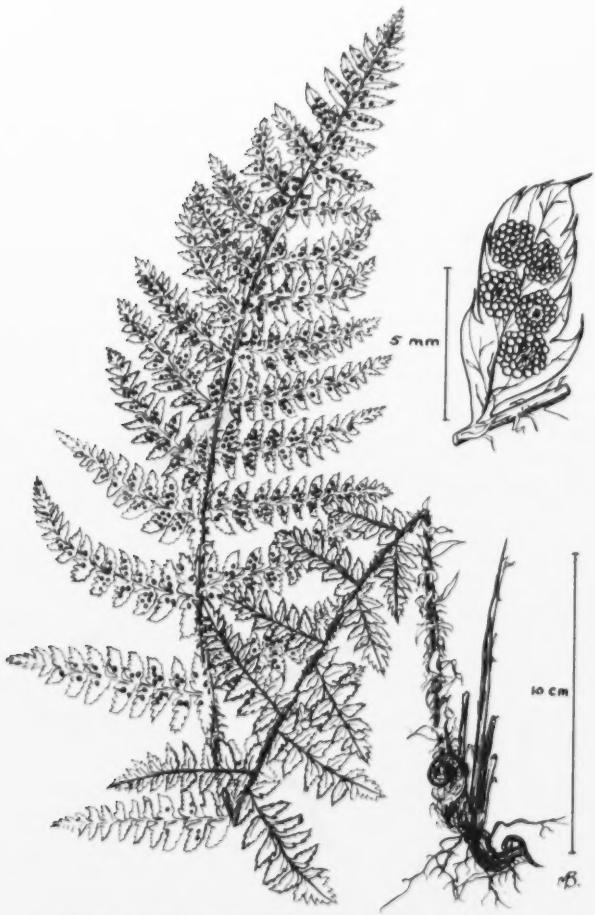
Habitat.—Cool moist thickets and shaded rocky slopes.

Range.—Alaska to Wash., Idaho, and Mont.

Comments.—Known from central Vancouver Island, Texada Island, Mount Waddington, Alice Arm, and Illecillewaet River in the Selkirks. This is one of a large group of closely related species of wide distribution. It may ultimately prove to be only a geographic variant of *P. braunii*. It can best be distinguished from the latter by the buds on the fronds and by the fact that the lowest pinnule on the upper side of the pinnæ is longer than the one next to it.

Polystichum braunii (Spenner) Fee. Braun's Holly-fern

Rhizome very stout, erect. Fronds numerous, ascending in a vase-like crown. Stipe stout, flattened and furrowed above, up to 20 cm. long, densely chaffy with pale-brown scales, the larger ones long attenuate. Blades subcoriaceous, lustrous green above, more or less deciduous, elliptic-lanceolate, conspicuously tapering at base and tip, up to 10.0 dm. long, and about one-fourth as broad, 2-pinnate. Pinnæ lanceolate to narrowly oblong, obtuse to acute, densely chaffy on the rachis below, alternate above, subopposite



Polystichum braunii (Spenner) Fee. Braun's holly-fern.

below. Pinnules narrowly ovate to trapezoid-oblong, obtuse, nearly rectangular at base, slightly auricled on the upper side, sharply serrate with incurved, bristle-tipped teeth. Sori in 2 rows near the mid-vein; indusia often with erose margins.

Habitat.—Cool, shaded talus slopes and rich rocky woods.

Range.—Southern coast of Alaska and adjacent B.C.; Great Lakes basin to Nfld., s. to Wis. and Pa.; Eurasia.

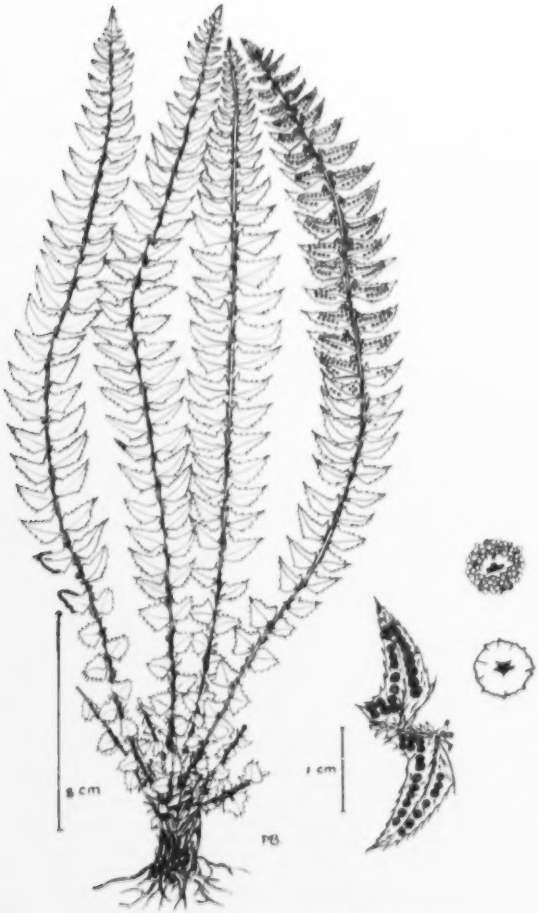
Comments.—Apparently very rare in British Columbia; only two collections have been seen, one from the Stikine River and the other from near Ymir. The absence of proliferous buds on the fronds and the relatively uniform size of the basal pinnules on the lower pinnæ will distinguish this species from *P. andersonii*.

Polystichum lonchitis (L.) Roth. Holly-fern

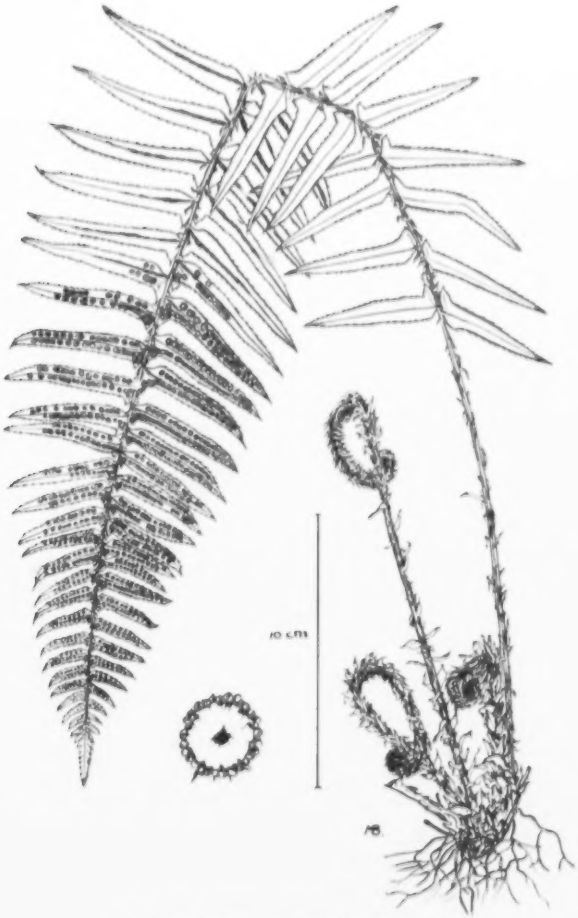
Rhizome stout, erect or ascending, chaffy and covered with old stipe-bases. Fronds several, ascending in a close crown, up to 50 cm. long. Stipes very short, about one-sixth the length of the blade or less, straw-coloured, densely chaffy with lustrous, rusty-brown, mostly large ovate, denticulate scales. Blades evergreen, coriaceous, linear to narrowly linear-oblanceolate, acuminate, 2–7 cm. broad, tapering gradually to the base, narrowed at the apex, simply pinnate, the rachis stout with deciduous scales. Pinnæ numerous, alternate, crowded, spreading at right angles, the basal deltoid, sometimes very small, equilateral, the middle and upper ones oblong-lanceolate, falcate, their bases auriculate above and cuneate below, unevenly serrate-dentate, the teeth conspicuously spreading-spinulose. Sori large, touching, usually in two rows, nearly midway between the mid-vein and the margin, mostly confined to the upper half of the frond. Indusia large, irregularly toothed.

Habitat.—Crevices of rocks, mostly basic; cool, shaded talus and rocky slopes.

Range.—Alaska to Nfld., s. to n. Calif., Utah, Col., and N.M.; region of upper Great Lakes; s. Que.; Greenland; Eurasia.



Polystichum lonchitis (L.) Roth. Holly-fern.



Polystichum munitum (Kaulf.) Presl.
Western sword-fern.

Comments.—General throughout British Columbia at higher elevations, particularly common in the sub-alpine zone. The hard, rather stiff, leathery fronds, lustrous and dark green above, paler and scaly below, are diagnostic features.

***Polystichum munitum* (Kaulf.) Presl. Western Sword-fern**

Rhizome stout, woody, ascending, covered with reddish-brown scales. Fronds stiffly erect, forming a crown, up to 15 dm. tall. Stipes 5–60 cm. long, densely chaffy; scales bright glossy brown often dark-centred, ovate-acuminate, mixed with laciniate-ciliate smaller ones. Blades evergreen, linear-lanceolate, short acuminate, up to 11 dm. long and 25 cm. wide, simply pinnate, scarcely contracted at the base. Pinnæ alternate, numerous, often very scaly beneath, spreading, subfalcate, linear-attenuate, prominently auriculate at the base above, cuneate below, sharply 2-serrate to incised, teeth incurved, rigidly long aculeate. Sori large, nearly equidistant between the mid-vein and the margin when in one row, sometimes in several crowded rows; indusia papillose-dentate to long-ciliate.

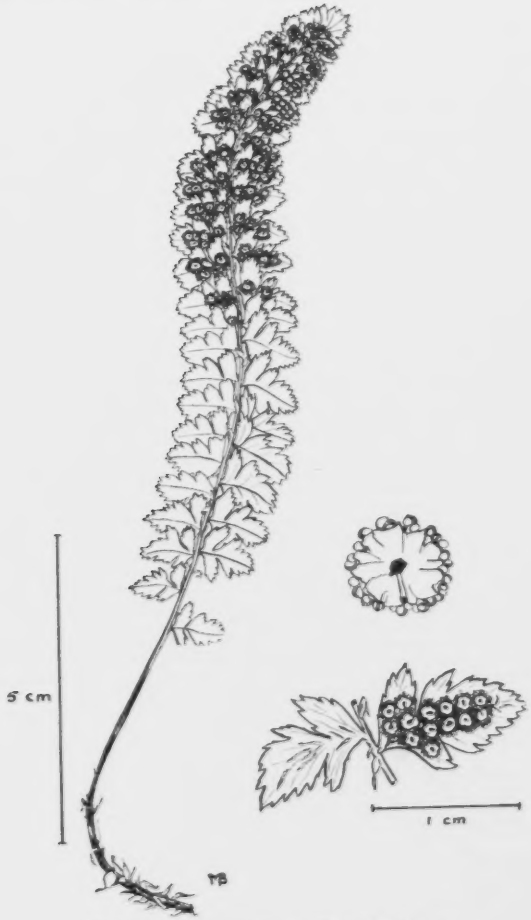
Habitat.—Damp rich woods and shaded slopes.

Range.—Alaska to Calif. and w. Mont.

Comments.—Widespread and very common west of the coastal mountains. Quite a variable species both in stature and outline of the fronds, the variability in great measure being related to differences in soil conditions and exposure. An extreme response to full sun and dry conditions is shown by forma *imbricans* (D. C. Eaton) Clute, which has a narrow linear blade and closely crowded, obliquely overlapping pinnæ.

***Polystichum scopulinum* (Eaton) Maxon. Rock Shield-fern**

Rhizome relatively stout, erect or decumbent, conspicuously covered with linear light-brown scales. Fronds mostly spreading, or ascending, evergreen, up to 30 cm. long. Stipes 2–15 cm. long, grooved above, upper parts straw-coloured, base chestnut, densely



Polystichum scopulinum (Eaton) Maxon.
Rock shield-fern.

chaffy; scales ovate- to narrow-lanceolate, bristle-tipped, cinnamon or light brown, considerably intermixed with narrower scales and viscid trichomes. Blades leathery to somewhat fleshy, pinnate, narrowly lanceolate, somewhat reduced to base and apex, pale green. Pinnæ subopposite, essentially sessile, deltoid-ovate to deltoid-oblong, obtuse, pinnately lobed or divided particularly toward the base, teeth more or less spinulose, appressed, lower pinnæ more widely separated. Sori conspicuous in 2 median rows, often fusing in age; indusia pale, erose-dentate. (*P. mohrioides* (Bory) Presl. var. *scopulinum* (D. C. Eaton) Fernald.)

Habitat.—Cliffs and dry crevices of basic rocks.

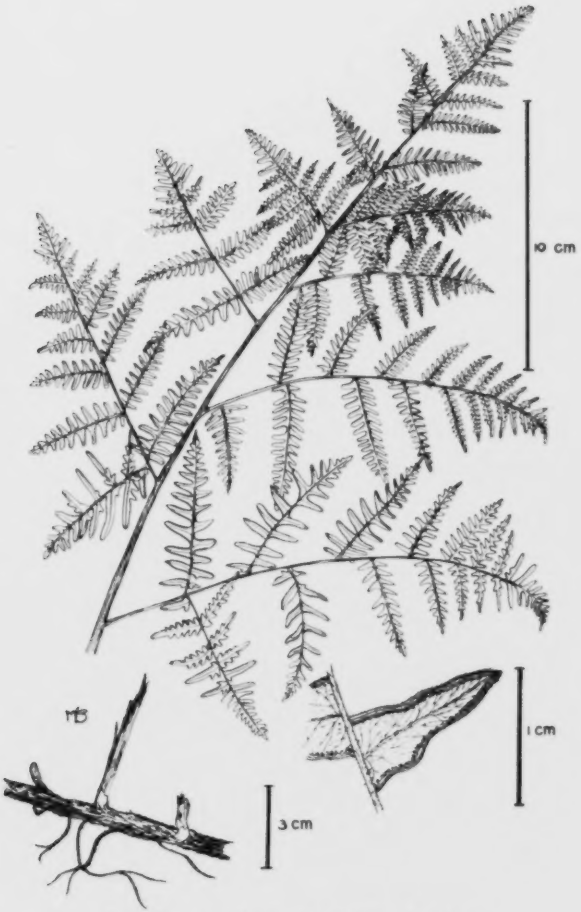
Range.—Southern B.C. to S. Calif., e. to Idaho, Utah, and Ariz.; Gaspé Pen.

Comments.—Very local in the Cascade Mountains, known from the Bridge River Mountains, Coquihalla, and Tulameen. Henry reports this species from Texada Island apparently on the basis of a collection by W. B. Anderson, 1897. In the Provincial Museum such a specimen exists, but in the University herbarium a specimen bearing the identical data is *P. andersonii*, a very different species. Until recollected, its occurrence on Texada Island is open to question.

PTERIDIUM Gled.

Rhizome subterranean, much branched, wide-spreading, clothed with hairs but not scales. Fronds very large, deciduous, scattered along the rhizome. Stipes stout, relatively long, somewhat straw-coloured. Blade coarse, usually 3-pinnately compound. Pinnæ subopposite, pinnules alternate, ultimate divisions very numerous, oblong to linear, with revolute margins. Sori marginal, mostly continuous, covered by a false outer indusium formed by the revolute margin and a minute, often nearly obsolete, hyaline inner indusium. (Name a diminutive of *Pteris*, the classical Greek name for ferns.)

Consists of a single world-wide species.



Pteridium aquilinum (L.) Kuhn. Bracken.

***Pteridium aquilinum* (L.) Kuhn. Bracken**

Characters those of the genus (*Pteris aquilina* L.)

Habitat.—Open places generally, in subacid soil.

Range.—Cosmopolitan in temperate to tropical regions.

Comments.—Found generally throughout the Province except at high altitudes. Our geographic form is var. *pubescens* Underw. (var. *lanuginosa* Bong.). This is characterized by the indusia being ciliate and pubescent with the ultimate divisions of the fronds woolly beneath.

THELYPTERIS SCHMIDEL

Rhizomes slender, wide-creeping, very dark, sparsely scaly, scales entire, fibrous, ciliate as a rule. Stipes slender, straw-coloured. Blades all alike or sometimes subdimorphic, pinnate-pinnatifid or 2-pinnate; divisions entirely or nearly so, thin, at most sparingly scaly or not at all, pubescent with sharp-pointed unicellular hairs at least on the rachis and main veins above, ultimate divisions ciliate. Veins few, simple or once forked, reaching the margins and running into the teeth (if present). Sori dorsal on the veins, medial or supramedial. Indusia small or sometimes absent, kidney-shaped, mostly ciliate or glandular. (Named from the Greek *thelus* (female) and *pteris* (fern).)

Very large cosmopolitan genus of temperate and sub-tropical regions.

Indusia lacking; blades narrowly deltoid; rhizome wide-spreading; fronds scattered ..... *T. phegopteris*

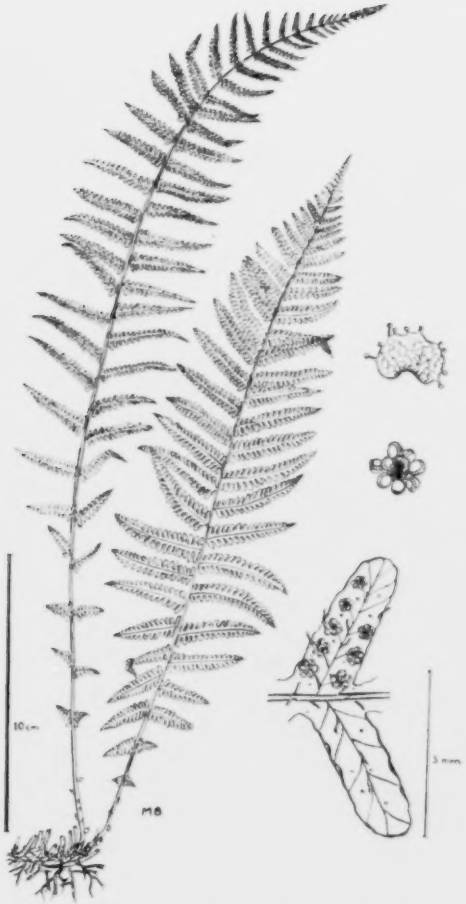
Indusia present; blades lanceolate or oblanceolate, distinctly narrowed below; rhizome much less spreading; fronds somewhat clustered.

Ultimate divisions 4–5 mm. broad, margins distinctly hyaline-papillose; veins often forked ..... *T. oreopteris*

Ultimate divisions about 2 mm. broad, margins only slightly hyaline, veins mostly simple ..... *T. nevadensis*

***Thelypteris nevadensis* (D. C. Eaton) Clute. Sierra Wood-fern**

Rhizome slender, horizontal and nearly superficial, covered by the persistent old stipe-bases, scales yellowish-brown, ovate, some-



Thelypteris nevadensis (D. C. Eaton) Clute.
Sierra wood-fern.

what toothed. Fronds erect, few, in a compact tuft, membranous, deciduous. Stipes slender, very short, straw-coloured, almost glabrous. Blades pinnate-pinnatifid, narrowly elliptic-lanceolate, up to 60 cm. long and 15 cm. broad, acuminate, long-attenuate, very narrow below. Pinnæ linear to linear-lanceolate, horizontal, sessile, acuminate to almost caudate, the larger upper ones close together, the lower distant and very much reduced. Ultimate divisions oblong, somewhat oblique, close together, usually obtuse, entire or slightly crenate, minutely resinous-glandular and with a few early deciduous cilia. Veins mostly unbranched, slightly hairy beneath. Sori close to the margin, small; indusia very small, long-ciliate, glandular. (*Dryopteris oregana* C. Chr.)

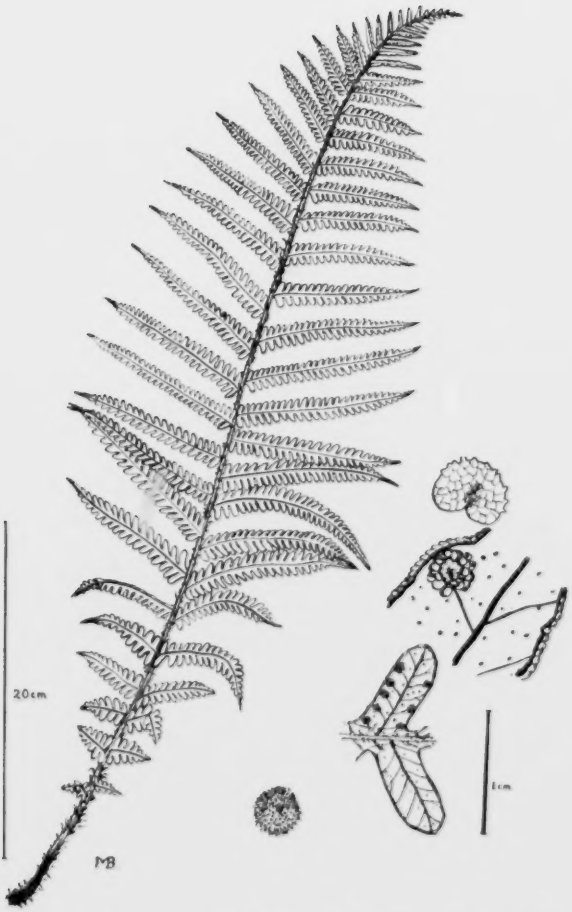
Habitat.—Wooded hillsides, damp meadows, and edges of streams.

Range.—Southern B.C. to Calif.

Comments.—Very rare in British Columbia, known only from a single station not far from the mouth of the Sooke River, V.I. Here it grows among boulders at the endge of the water and is subjected to frequent flooding.

Thelypteris oreopteris (Ehrh.) Slosson. Mountain Wood-fern

Rhizome short, rather stout, more or less ascending, with lanceolate yellowish-brown scales. Fronds few, grouped at the end of the rhizome, up to 10 dm. tall, deciduous. Stipes relatively stout, grooved above, straw-coloured from a dark scaly base, about one-fourth as long as the blade. Blades lanceolate or oblanceolate, abruptly acuminate, up to 75 cm. long, tapering to a narrow base, firm, yellowish-green, aromatic when crushed, lower surface with numerous brownish-yellow glands, pinnate-pinnatifid. Pinnæ up to 12 cm. long, the longest (about the middle of the blade) linear-lanceolate, narrowed at the base but not stalked, shorter below; the lowest distant, deltoid, quite short; all deeply pinnatifid, main vein soft white hairy below at least while young. Ultimate divisions oblong, wide at the base, obtuse or subacute, sinuate-crenate



Thelypteris oreopteris (Ehr.) Slosson. Mountain wood-fern.

or subentire, membranous margins often recurved, finely hyaline-papillose. Veins simple or once forked. Sori small, close to the margin. Indusia small, thin, early deciduous, irregularly toothed, glandular. Spores finely echinulate. (*Aspidium oreopteris* Sw., *Dryopteris oreopteris* (Ehrh.) Maxon).

Habitat.—Open rocky woods, especially mountain-sides and sub-alpine meadows in acid soil.

Range.—Alaska s. to n. Wash.; Japan; Eurasia.

Comments.—Apparently rare in British Columbia, having been collected only in the north-western part of the Province at Alice Arm and in the Skeena Valley near Prince Rupert, and in the Selkirk Mountains in the south-east.

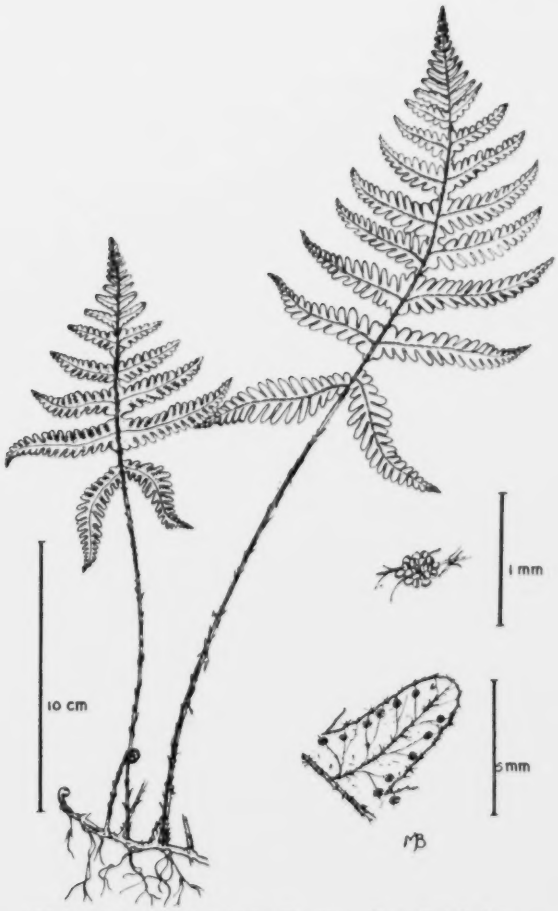
***Thelypteris phegopteris* (L.) Slosson. Long Beech-fern**

Rhizome slender, long, creeping just below the surface of the ground, hairy with brown lanceolate scales when young. Fronds solitary, rather widely separated, up to 40 cm. tall, deciduous. Stipes pale straw-coloured, hairy and scaly throughout, longer than the blades. Blades triangular-ovate to deltoid, bent nearly at right angles to the stipe, tapering to the tip, pinnate-pinnatifid. Pinnæ more or less hairy on both surfaces, lanceolate, the basal pair inclined forward away from the others, longer or slightly shorter than the pair above, the remainder decreasing rapidly in length, all (except the lowermost) attached to the rachis by a broad, decurrent base. Ultimate divisions herbaceous, oblong, obtuse, entire or crenate. Sori small, submarginal, indusia lacking. (*Phegopteris phegopteris* (L.) Underw., *Dryopteris phegopteris* (L.) C. Chr.)

Habitat.—Open damp woods, wet mossy rocks and crevices, usually in half-shade.

Range.—Alaska to Nfld., s. to Ore., Iowa, Mich., Ohio, Tenn., and N.C.; Eurasia.

Comments.—This attractive circumboreal species is found in cool woods throughout the Province. The characteristic shape of the fronds, particularly the features of the lowest pinnæ, serve to distinguish it.



Thelypteris phegopteris (L.) Slosson. Long beech-fern.

WOODSIA R. Br.

Rhizomes short-creeping or ascending, with ovate-lanceolate to linear-lanceolate brown scales. Fronds numerous, usually densely tufted, erect or spreading. Stipes from stout to slender, much shorter than the blades, in some species articulated at the base, and in such cases the stipe-bases are persistent. Blades all alike, linear to lance-ovate, pinnate-pinnatifid or pinnate-2-pinnatifid, glabrous, variously scaly or hairy, sometimes glandular. Sori on the back of veinlets, round, separate at first but later often confluent. Indusia thin, arising from below the sporangia and enclosing them with few to many hair-like or narrow or broad lobes. (Named in honour of Joseph Woods, 1776–1864, an English botanist.)

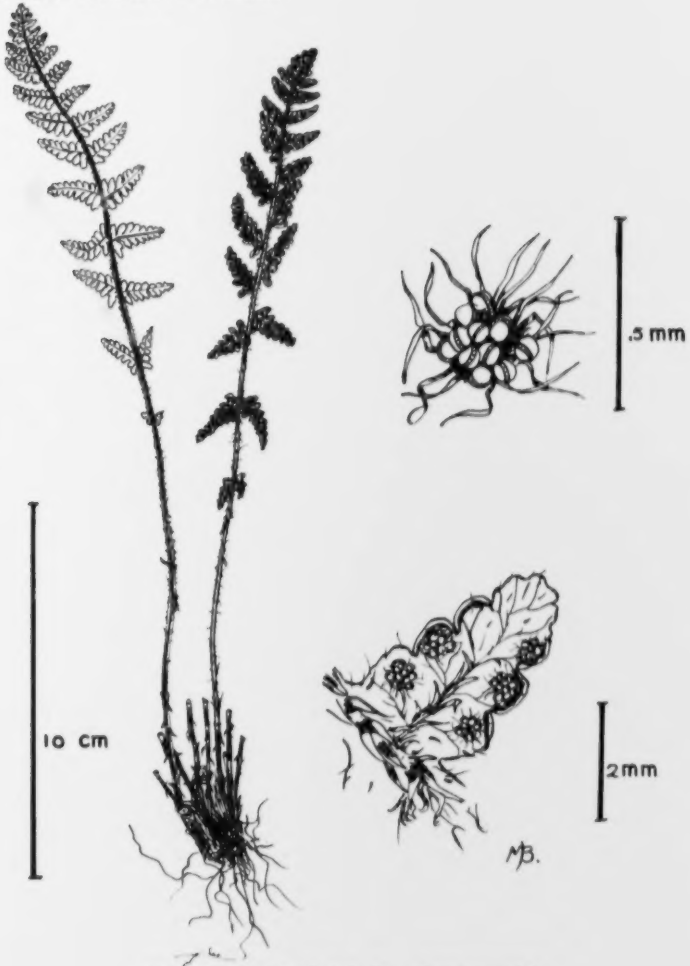
A small genus, largely of rock ferns, found growing mostly in temperate and boreal regions.

Stipes articulated near the base, the joint appearing as a slightly thickened, darker ring; rachis and midrib of pinnæ scaly ..... *W. ilvensis*
Stipes not articulated; rachis not scaly but may be hairy.
Fronds and stipes glabrous or somewhat glandular but not hairy ..... *W. oregana*
Fronds and stipes with conspicuous white hairs mixed with glands ..... *W. scopulina*

Woodsia ilvensis (L.) R.Br. Rusty Woodsia

Rhizome ascending, covered with the persistent old stipe-bases and very numerous, brown, lanceolate-attenuate scales. Fronds up to 20 cm. long in dense tufts, erect or somewhat spreading. Stipes stout, shining, dark brown below, paler above, scaly and hirsute, distinctly articulated below the middle, bases persistent, densely brown scaly. Blades lanceolate, dark green, pinnate-pinnatifid, somewhat reduced at the base, acute above, usually chaffy and pilose on the lower surface. Pinnæ oblong-ovate to oblong-lanceolate, pinnatifid. Ultimate divisions oblong, obtuse, the larger crenately lobed, margins revolute, sparsely ciliate. Sori numerous, frequently confluent; indusia with numerous long hair-like segments conspicuously overtopping the sporangia.

Habitat.—Dry rock crevices and exposed talus slopes.



Woodsia ilvensis (L.) R. Br. Rusty woodsia.

Range.—Alaska to Nfld., s. to B.C., Alta., n. Iowa, n. Ill., Mich., Pa. and N.C.; Greenland; Eurasia.

Comments.—This easily recognized species is apparently very rare in British Columbia; specimens have been seen from the 150 Mile House in the Cariboo, the Okanagan, and the head of the Stikine River. It has also been collected at Mount Robson and Banff.

***Woodsia oregana* D. C. Eaton. Oregon Woodsia**

Rhizome short-creeping, densely covered with pale-brown linear-lanceolate scales. Fronds numerous, erect, tufted, up to 30 cm. tall. Stipes stiff but rather slender, straw-coloured from a darker base, glabrous, scaly only toward the base. Blades bright green, lance-linear to lanceolate, 1.5–4.0 cm. wide, acuminate, slightly contracted at the base, pinnate-pinnatifid or pinnate-2-pinnatifid, glabrous, sparsely or sometimes quite grandular beneath. Pinnæ subopposite, triangular-oblong, blunt, rather distant, sessile. Pinnules of the principal pinnæ close together, blunt, often pinnatifid, decurrent, margin crenate-serrulate, usually reflexed. Sori often partly concealed by the reflexed margin; indusia minute, divided nearly to the base into several short, narrow, almost thread-like segments, quite concealed by the sporangia.

Habitat.—Dry crevices and talus slopes.

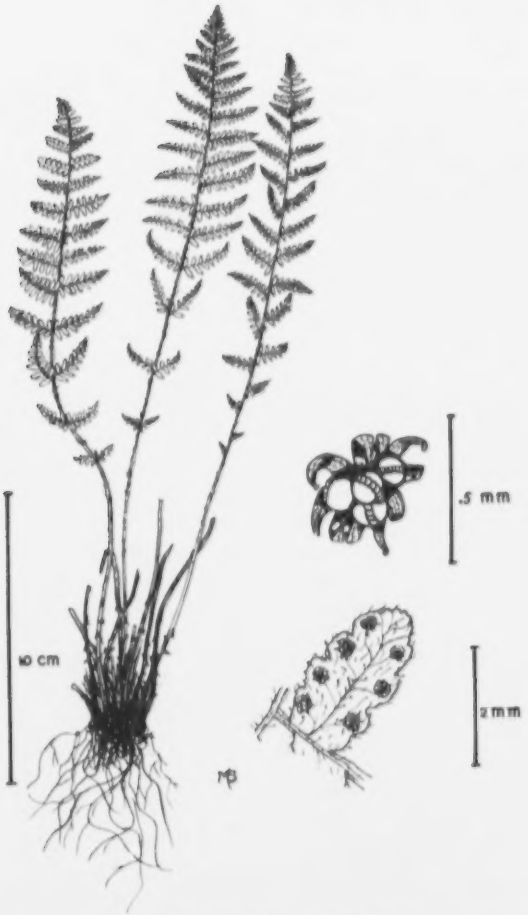
Range.—B.C. and Alta., s. to Calif., Ariz., N.M., w. Okla, Neb., n. Iowa to n. Wis., Upper Great Lakes region, and Rimouski Co., Que.

Comments.—Quite generally distributed throughout the dry interior to as far north at Ootsa Lake. Can be distinguished from *W. scopulina*, which grows in similar situations, by its smaller size and narrow glabrous fronds.

***Woodsia scopulina* D. C. Eaton. Rocky Mountain Woodsia**

Rhizome stoutish, short-creeping, densely covered with lance-ovate hair-tipped pale-brown scales often with a dark central stripe. Fronds numerous in quite large tufts, erect, up to 40 cm. tall.

Woodsia oregana D. C. Eaton. Oregon woodsia.



Woodsia scopulina D. C. Eaton.
Rocky Mountain woodsia.

Stipes firm, light straw-coloured above, chestnut below, pilose, only scaly at the base, not jointed. Blades linear to oblong-lanceolate, 2.5–6.5 cm. Broad, short-acuminate, somewhat narrowed toward the base, 2-pinnate or pinnate-pinnatifid, pilose with few to many flat whitish hairs mixed with glands, not scaly. Pinnæ oblong-lanceolate to oblong-ovate, acuminate, rather distant, sessile. Ultimate divisions oblong-obtuse, crenately lobed or pinnatifid, rather close together. Sori supramedial; indusia deeply cleft into a number of flat lanceolate- to linear-attenuate segments concealed by the sporangia.

Habitat.—Dry crevices and talus slopes.

Range.—Alaska to Sask., s. to Calif., N.M., and S.D.; Upper Great Lakes region and Gaspé, Que.

Comments.—Widely spread and locally quite common, particularly in the southern interior of the Province. Distinguished from *W. oregana* by its viscid, very brittle, pilose fronds.

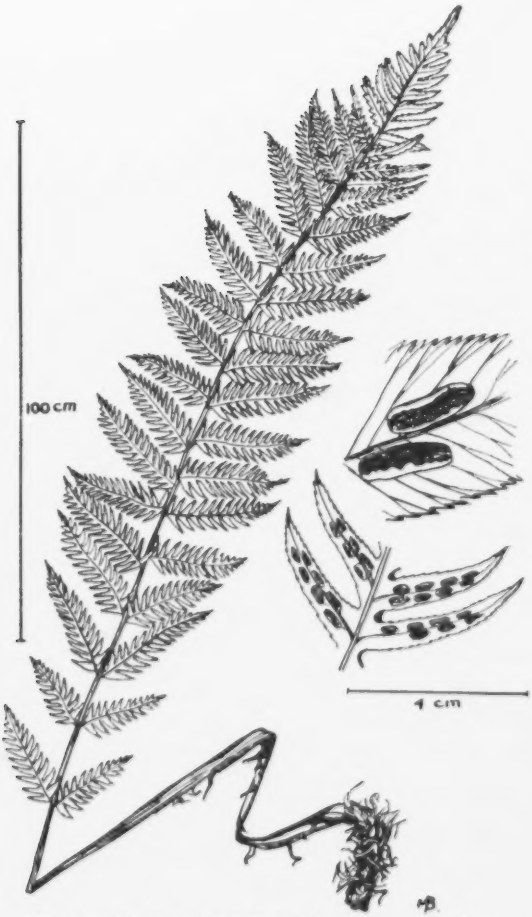
WOODWARDIA J. E. SMITH. CHAIN-FERN

Mostly large coarse ferns of bogs and wet shady situations. Rhizome very stout, widely creeping or sometimes more or less erect, with brown, ovate, acuminate scales. Fronds stiffly erect or somewhat recurved, several or many in a crown. Stipes about equalling the blades. Blades pinnate, pinnæ-pinnatifid or lobed, alternate, glabrous, margins serrulate, sparingly scaly on the rachis and main veins. Sori oblong to linear, in one or more chain-like rows parallel to and near the midrib; indusia persistent, at first completely covering the sporangia, later reflexed, opening on the side next to the midrib. (Named in honour of Thomas J. Woodward, 1745–1820, an English botanist.)

A small genus of the temperate and tropical regions of the Northern Hemisphere.

Woodwardia fimbriata J. E. Smith. Giant Chain-fern

Rhizome very large and stout, woody, ascending, with conspicuous lance-attenuate, glossy, bright-chestnut scales. Fronds



Woodwardia fimbriata J. E. Smith. Giant chain-fern.

evergreen, more or less erect, very large and coarse, up to 3 m. tall. Stipes short and stout, light-straw coloured from a darker base. Blades broadly linear-oblong to oblong-oblanceolate, rather abruptly acuminate, narrowed toward the base, up to 45 cm. broad, pinnate. Pinnæ linear-oblong to ovate, long acuminate, deeply and obliquely pinnatifid. Ultimate divisions narrowly triangular to linear, subfalcate, attentuate, irregularly and shallowly crenate or lobed, serrate-spinulose, paler on the lower surface. Sori in 2 rows, very large and conspicuous. (*W. spinulosa* of Henry.)

Habitat.—Damp shady woods and banks.

Range.—B.C. s. to Calif. and Ariz.

Comments.—Very rare in British Columbia, known with certainty only from Texada and Lasqueti Islands. A record from Saanich Arm, Vancouver Island, may be in error as the species has not been recollected in the area.

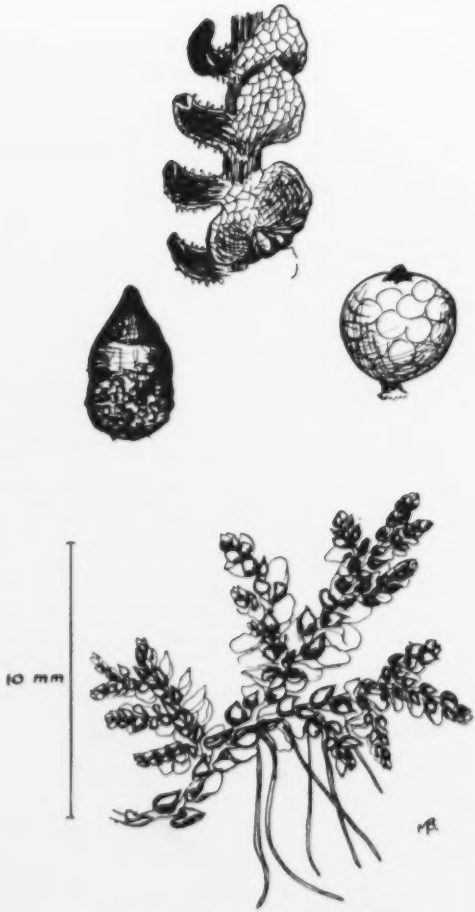
SALVINIACEÆ—WATER-FERN FAMILY

Small, annual, aquatic floating ferns with a more or less elongated and sometimes branching filiform rhizome, bearing apparently distichous leaves. Leaves small, papillose or tuberculate. Sori terminal on lobes of leaves, soft and with a thin wall formed by the indusium, borne 2 or more on a common stalk. Sporangia of two kinds, producing either very numerous microspores or a few or a single megaspore.

A family of only two genera and a small number of species, widely distributed, mostly in tropical and sub-tropical regions.

AZOLLA Lam. Water-fern

Stems pinnately branched, dropping down inconspicuous, unbranched, thread-like roots; branches covered with minute imbricate leaves. Leaves 2-lobed, the lower usually larger than the upper, mostly without chlorophyll and only 1 cell thick; the upper aerial lobe papillose. Sporocarps (sori) in pairs in leaf axils, usu-



Azolla mexicana Presl. Water-fern.

ally unlike, the microsporocarp large and globose, the megasporocarp much smaller, acorn-shaped; megasporangia develop singly, each containing a single basal megaspore.

A small genus of less than a dozen species of wide distribution in temperate and tropical regions.

***Azolla mexicana* Presl.**

Characters essentially those of the genus. Plants up to 10 mm. wide; upper leaf-lobes considerably smaller than the lower; basal part of the megaspore conspicuously pitted.

Habitat.—Ponds and edges of slow streams.

Range.—Southern B.C. to Bolivia, Nev., Utah, Mo., Ill., and Wis.

Comments.—This very characteristic little moss-like floating water-fern is known in the Province only from Shuswap Lake near Sicamous. Specimens from here have been identified by Dr. H. K. Svenson, an authority on the genus.

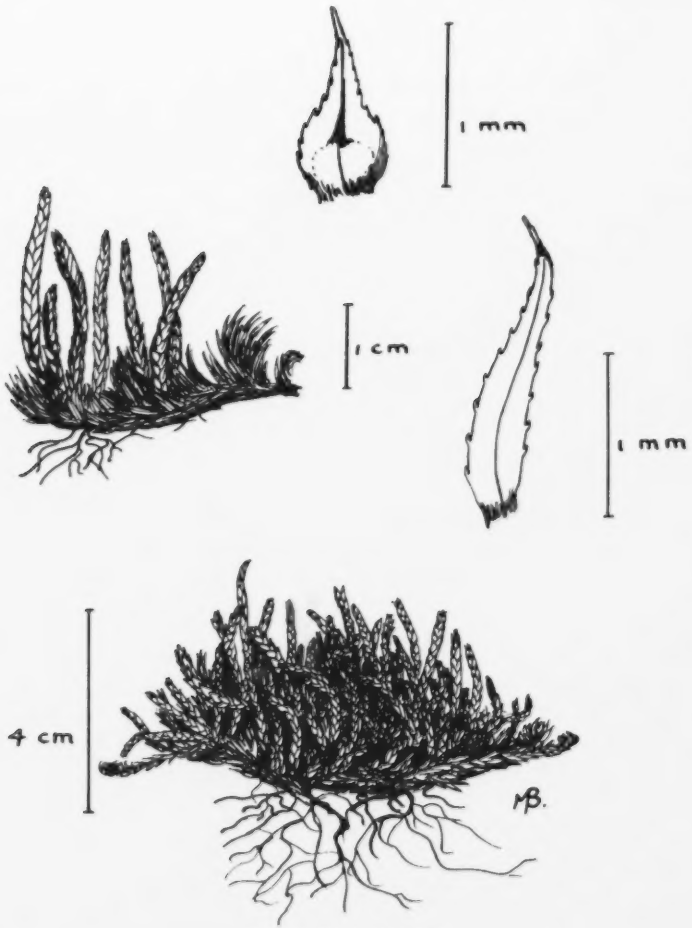
SELAGINELLACEÆ Beauv. Spikemoss Family

Low, depressed or creeping, moss-like plants (our species). Stems slender, more or less dichotomously branched. Roots few, very fine and thread-like. Leaves small, in 4–6 rows, very numerous, usually imbricate, simple, lanceolate or subulate. Cones terminal, four-sided or terete in a few species, sporophylls usually similar to the vegetative leaves, each bearing a single axillary sporangium. Sporangia reniform, more or less sessile, of two types, usually the upper ones producing very numerous microspores and the lower 4 large megaspores. Spores tetrahedral, megaspores yellowish or white with a thick sculptured wall, microspores reddish or orange, spinulose.

The family contains the single genus *Selaginella* of about 500 species of world-wide, but mostly tropical, distribution.

Leaves lanceolate, not bristle-tipped; stems slender and creeping but not tufted, herbaceous; cones more or less terete ..... *S. selaginoides*

Leaves subulate, bristle-tipped; stems spreading but tending to form mats or tufts, evergreen; cones sharply 4-angled.



Selaginella densa Rydb.

Branches somewhat flattened; leaves of the under-ranks largest, obliquely imbricate ..... *S. densa*
Branches not at all flattened; leaves uniform, equally ascending or appressed-imbricate on all sides ..... *S. wallacei*

Selaginella densa Rydb.

Densely tufted, main stems creeping, up to 12 cm. long with many short, erect or ascending, crowded, sterile branches. Leaves subglaucous, densely imbricate and many-ranked, 3–5 mm. long (including the seta), those of the underside largest, linear to lance-subulate, somewhat tapering to an obtusish apex, grooved on the back, margins short ciliate, 6–17 cilia on each side, mostly oblique and incurved; seta 0.5–2.0 mm. long, whitish-hyaline, scabrous. Cones stiffly erect or the shorter ones curved, 1.0–2.5 cm. long, sharply 4-angled. Sporophylls 4-ranked, broadly ovate, long acuminate, about one-half as long as the vegetative leaves but otherwise similar.

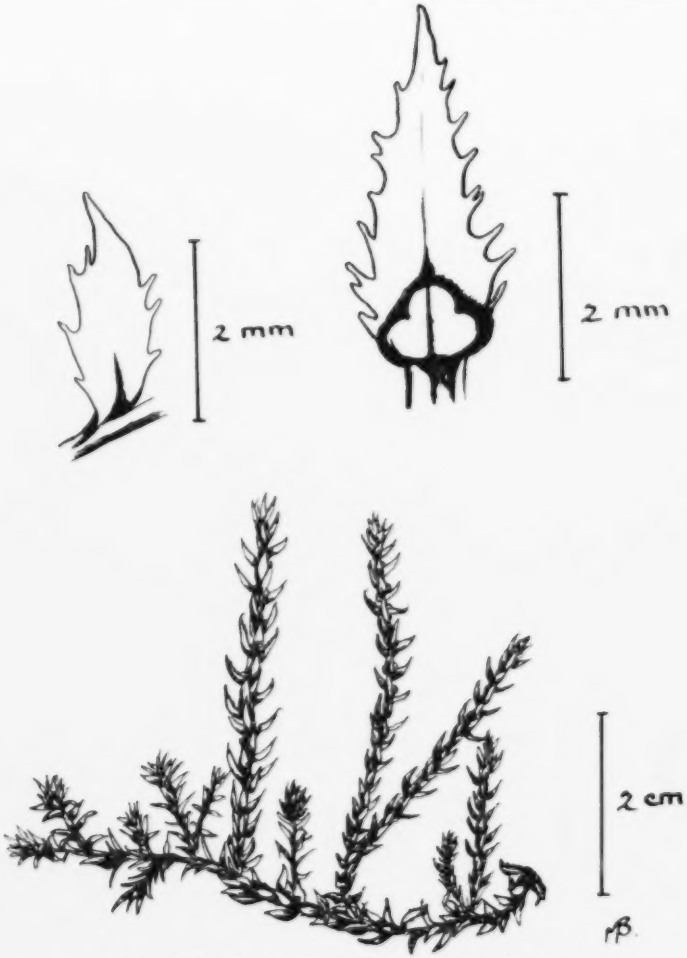
Habitat.—Dry rocks and rocky places, exposed hillsides, and dry ground.

Range.—B.C. to Alta., s. to Calif., Utah, N.M., w. S. Dak., and Neb.

Comments.—This is the common spikemoss of dry situations in the interior of the Province; it is known only from east of the coastal mountains. The great majority of the specimens examined from our area fall into var. *scopulorum* (Maxon) Tryon, with more or less gradually tapering, only slightly obtuse, leaves, eciliate toward the tip.

Selaginella selaginoides (L.) Link. Mountain Moss

Sterile stems weak, prostrate, mostly 2–5 cm. long, forming small mats. Leaves spirally arranged, uniform, spreading ascending, lanceolate. Fertile stems erect, up to 10 cm. tall, filiform, the leaves in many ranks, ascending, up to 4 mm. long, 1 mm. wide, acuminate, not bristle-tipped, spinulose-margined (with not more than 3–5 spinules on each side), cuneate at base, inconspicuously 1-nerved. Cones subcylindric, 1.0–4.0 cm. long and up to 5 mm.



Selaginella selaginoides (L.) Link. Mountain moss.

wide; sporophylls mostly in 10 ranks, larger than the leaves, more prominently spinulose and nerved; spinules more numerous.

Habitat.—Wet banks and rocky ledges.

Range.—Alaska to Nfld., s. to B.C., Idaho, Colo., n. Minn., n. Mich., N.H., and n. Me.; Greenland; Eurasia.

Comments.—Generally distributed throughout British Columbia, never very common and apt to be overlooked because of its small size. Its yellowish-green colour and slender cones are distinguishing features.

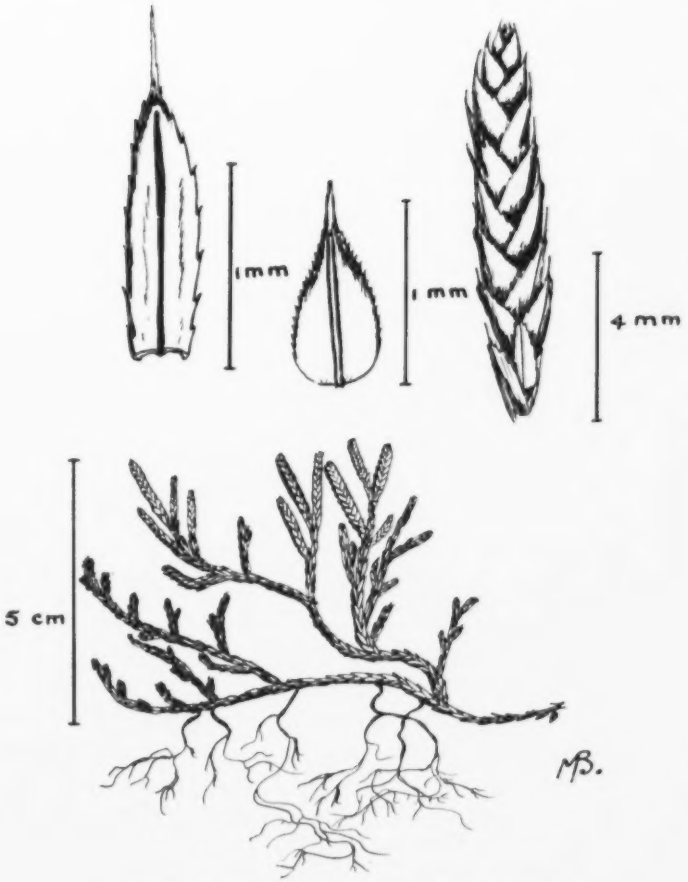
Selaginella wallacei Hieron. Wallace's Selaginella

Plants forming loose mats. Main stems prostrate, up to 15 cm. long, rooting sparsely throughout. Branches numerous, ascending, up to 4 cm. long, freely branched. Branchlets short, wide-spreading, rather rigid, cord-like, often intertwined. Leaves papery, rigidly appressed-imbricate on all sides, subglaucous, mostly oblong-linear with 8–14 oblique cilia on each side, narrowed to an obtusish apex but prolonged into a stiff, bristle-like seta, about 3 mm. long (including the seta), seta about 0.5 mm. long, whitish-hyaline, scabrous. Cones numerous, 1–3 cm. long, somewhat curved; sporophylls narrowly ovate-deltoid with 10–18 rather variable cilia on each side, shorter than the vegetative leaves, abruptly setigerous with short, stout, whitish-hyaline, nearly smooth setæ.

Habitat.—Rocky bluffs and slopes.

Range.—B.C. to Mont., s. to Ore. and along the coast to s. Calif.

Comments.—Very common and widely spread throughout the southern half of the Province. Can usually be recognized by its rather loose growth and its rounded, not flattened, branches.



Selaginella wallacei Hieron. Wallace's selaginella.

DOUBTFUL OR EXCLUDED SPECIES

***Equisetum ramosissimum* Desf.**

This Eurasian species has been erroneously reported by Henry, apparently on the authority of Underwood and on the basis of a collection by Lyall.

***Lycopodium sabinæfolium* Willd.**

Henry states: "Rockies, Selkirks, Mt. Arrowsmith." As no British Columbian specimens of this eastern American species have been seen, there is little doubt that he was referring to *L. sitchense* Rupr.

***Botrychium matricariæfolium* A. Br.**

This species is reported by Henry (as *B. ramosum* (Roth) Aschers) from Agassiz. No supporting specimens have been discovered, however. The species is known from Camrose, Alta., and Kootenai Co., Idaho, and so may well be present in the Province.

***Ophioglossum vulgatum* L.**

As reported by Eastham, this species is known only from a plant that appeared spontaneously in a garden at Crawford Bay on Kootenay Lake. It was found growing where plants from the Monashee Mountains had been set out. Until collected in the wild state, the evidence for it being indigenous to the Province remains inconclusive. The fact that it has been collected on Orcas Island, Wash., lends strong encouragement to the belief that it may also occur in British Columbia.

***Polystichum lemmonii* Underw.**

Although Henry includes this species, he mentions no specific localities, only the generalized range: "Alaska to California." Hulten can offer no basis for its reported occurrence in Alaska. Known collections indicate its northern limit to be the Wenatchee Mountains, Wash.

GLOSSARY

Two standard works have been freely consulted in connection with this glossary: "A Dictionary of Scientific Terms," by Henderson and Henderson, Fifth Edition, by J. H. Kenneth, and "A Glossary of Botanic Terms," by B. D. Jackson.

Aculeate—having prickles, sharp points.

Acuminate—drawn out into a long point.

Acute—distinctly and sharply pointed, but not drawn out.

Adnate—united to an organ of a different kind; fusion of unlike parts.

Anastomosing—joining of one vein with another.

Annulus—special ring of cells in fern sporangium, by action of which sporangium bursts.

Apiculate—furnished with a sharp and short, but not stiff, point.

Appressed—lying flat for the whole length of the organ.

Aristate—provided with a well-developed bristle or awn.

Articulated—jointed; separating easily at certain points.

Ascending—directed upwards, as the stem; the ascending axis is oblique at first, then erect.

Attenuate—narrowed or tapered.

Auricle—any ear-like, lobed appendage.

Auriculate—eared.

Awn—bristle-like appendage.

Axil—the angle between leaf or branch and the axis from which it arises.

Blade—the flat expanded part of a leaf.

Callous—having the texture of a hardened thickening.

Capitate—enlarged or swollen at the tip; pin-headed.

Cartilaginous—hard and tough.

Caudate—having a tail.

Caudex—the axis of a woody plant consisting of stem and root.

Cespitose—growing densely in tufts.

Ciliate—fringed with hairs.

Circinate—coiled into a ring.

Coherent—with similar parts united.

Confluent—blended into one; running together.

Connate—united; used especially with reference to like structures.
Cordate—heart-shaped; applied to leaves having the petiole at the broader and notched end.
Coriaceous—leathery.
Cortex—rind or outer part of stem or root.
Crenate—with scalloped margins.
Crenulate—with margins minutely crenate.
Cuneate—wedge-shaped.
Cuspitate—terminating in a sharp, rigid point.
Deciduous—falling at maturity.
Decompound—several times divided or compounded.
Decumbent—stems which trail on the ground but rise at the apex.
Decurrent—extending down and adnate to the stem.
Dehiscence—to open spontaneously when ripe.
Deltoid—more or less the shape of an equilateral triangle.
Denticulate—minutely toothed.
Dichotomous—branched into two equal parts.
Dimorphic—occurring in two forms.
Distichous—two-ranked; alternate leaves so arranged that first is directly below third.
Divergent—separating by degrees.
Dorsal—surface farthest from the axis, e.g., the lower, or the outer, surface of the leaf.
Dorsiventral—with distinct upper and lower surfaces, on front and back.
Echinulate—having small prickles.
Epiphyte—plant which grows on other plants, but not parasitically.
Erose—having the margin irregularly notched, looking as though gnawed.
Falcate—sickle-shaped.
Filiform—thread-like.
Fimbriate—fringed at margin.
Flabellate—fan-shaped.
Flexuous—bent in a zigzag manner.
Frond—a leaf, especially of a fern.
Gametophyte—sexual generation of plants.
Gemma—bud that develops into a new plant.

Glabrous—smooth, without pubescence.
Glaucous—bluish-green; covered with a pale-green bloom.
Hyaline—clear; transparent or translucent.
Hygroscopic—sensitive to moisture.
Imbricate—having parts overlying each other like shingles.
Incised—cut sharply into the margin.
Indurated—hardened.
Indusium—an outgrowth covering and protecting a sorus.
Inequilateral—having two sides unequal.
Inferior—growing or arising below another organ.
Inrolled—rolled inwards.
Internode—part of a stem between two nodes or joints.
Lacerated—being deeply cut into irregular clefts.
Laciniate—slashed; irregularly cut into narrow lobes.
Lanceolate—tapering at each end; base usually somewhat broader than the apex and the greatest width at about one-third from the base.
Lax—loose, distant.
Linear—narrow, several times longer than wide, with parallel margins.
Lunate—half-moon shaped.
Marcescent—withering but not falling off.
Margined—furnished with a margin of distinct character.
Medial—situated in the middle.
Megaspore—larger of two sizes of spores produced.
Membranaceous—thin and semi-transparent, like a fine membrane.
Microspore—smaller of two sizes of spores produced.
Midrib—the principal vein of a leaf.
Mucronate—abruptly terminated by short, straight, often spiny, tip.
Mycorhiza—association of fungal mycelium with roots of a higher plant.
Node—place upon a stem at which a leaf is normally developed.
Nodose—having knots or swellings.
Ob—as a prefix means inversely or oppositely, as obovate, inversely ovate.
Oblique—slanting.
Obsolete—wanting or rudimentary.

Opaque—not transparent.
Orbicular—of a flat body with a circular outline.
Oval—broadly elliptic.
Ovate—egg-shaped, the broader end basal.
Palmate—leaves divided into lobes arising from a common centre.
Panicle—loose flower-cluster.
Paniculate—arranged as in a panicle.
Papillose—covered with minute nipple-shaped projections.
Peduncle—stem or stalk, supporting flower, fruit or cone.
Peltate—as a leaf fastened to stalk by its lower surface instead of by its margin.
Pentagonal—having five angles.
Persistent—remaining attached; not falling off.
Petiole—the stalk of a leaf.
Petiolule—the stalk of a leaflet of a compound leaf.
Pilose—hairy, downy; usually meaning soft, distinct hairs.
Pinna—leaflet of a compound leaf.
Pinnate—of a compound leaf, having leaflets on each side of an axis or rachis.
Pinnatifid—pinnately cleft half-way to midrib.
Pinnule—a secondary leaflet of a bipinnate leaf.
Prostrate—trailing on the ground; lying flat.
Puberulent—covered with down or fine hair.
Pubescent—covered with soft hair or down.
Rachis—the axis of a compound leaf or frond.
Reflexed—abruptly bent or turned backwards or downwards.
Reniform—kidney-shaped.
Repand—with undulated margin, less so than "sinuous."
Revolute—rolled backward, with margin rolled toward lower side.
Rhizome—any prostrate or underground stem, usually rooting at the nodes.
Rhomboid—quadrangular, with the lateral angles obtuse.
Rugose—wrinkled.
Salient—projecting forward.
Scabrous—rough to touch.
Semicordate—heart-shaped on one side only.
Septate—divided by partitions.

Serrate—notched on the margin like a saw.
Serrulate—finely notched.
Sessile—sitting directly on base with no support, stalk, petiole, or peduncle.
Seta—any bristle-like structure.
Setigerous—bearing bristles.
Silex—silica.
Siliceous—pertaining to silica.
Simple—of one piece, as opposed to compound.
Sinuate—with a deep, wavy margin.
Sinus—a recess or re-entering angle between two lobes.
Sorus—collection of small stalked sporangia on the underside of a fern frond.
Spatulate—spoon-shaped.
Spinule—small spine.
Spinulose—with small spines.
Sporangium—spore case.
Sporocarps—the indusium or body enclosing the sporangia in Salviniaceæ.
Sporophyll—sporangium-bearing leaf.
Stellate—star-shaped or radiating like the points of a star.
Stipe—leaf-stalk of a fern.
Strobilus—cone; an assemblage of sporophylls.
Sub—in compounds usually implies an approach to the condition designated; somewhat, or slightly.
Subulate—awl-shaped; narrow and tapering from base to a fine point.
Sulcate—furrowed; grooved.
Superior—growing or arising from another organ.
Supramedial—above the middle.
Ternate—arranged in threes; having three leaflets to a leaf.
Terete—circular in cross-section; cylindric and usually tapering.
Tetrahedral—four-sided, as a solid triangle.
Tomentose—covered closely with matted hairs.
Trapezoid—like an unsymmetrical four-sided figure.
Trichome—hair-like outgrowth from the epidermis.
Trifoliate—with three leaflets arising from the same point.

Tubercle—a wart-like or knobby projection.
Tuberculate—resembling or having tubercles.
Vallecular cavity—canal in cortex of stem of horsetail, related to the grooves.
Velum—membranous indusium in Isoëtes.
Vernation—arrangement of leaves within a bud.
Viscid—sticky.
Whorl—circle of leaves, etc., arising from one point on an axis.

INDEX TO COMMON NAMES AND SYNONYMS

	Page
Adder's-tongue fern	50
Anderson's holly-fern	116
Alpine lady-fern	71
Aspidium cristatum	95
filix-mas	95
oreopteris	129
rigidum	90
spinulosum	92
Asplenium cyclosorum	73
Athyrium americanum	71
Bladder-fern	89
Bracken	125
Braun's holly-fern	116
Botrychium silaifolium	56
Chain-fern	136
Cliff-brake	85, 104
Club-moss	32
Alaska	46
Alpine	35
Bog	41
Fir	44
Mountain	44
Running	37
Stiff	35
Coastal shield-fern	90
Common polypody	112
Crested shield-fern	92
Cryptogramma acrostichoides	82
Deer-fern	76
Dryopteris dilatata	92
disjuncta	99
linnæana	99
oregana	127
oreopteris	129
phegopteris	129
rigida	90
spinulosa	92
Equisetum limosum	15
litorale	15
maximum	28
Fragile fern	87
Fragrant shield-fern	97
Giant chain-fern	136
Golden-back fern	108
Grape-fern	50
Lance leaved	53
Leathery	56
Little	59
Northern	51
Ground-cedar	39
Ground-pine	41
Gymnogramma triangularis	110
Hard-fern	76
Holly-fern	118
Horsetail	11
Common	13
Giant	28
Marsh	20
Meadow	20
Swamp	13
Wood	25
Indian's dream	80
Lady-fern	73
Lace-fern	80
Leathery polypody	110
Licorice-fern	112
Limestone oak-fern	99
Long beech-fern	129
Maidenhair fern	63
Male-fern	95
Moonwort	53
Mountain bladder-fern	89
Mountain moss	142
Mountain wood-fern	127
Northern maidenhair fern	65
Oak-fern	99
Onoclea struthiopteris	104
Oregon woodsia	133
Ostrich fern	102
Parsley fern	82
Pellæa densa	80
occidentalis	105
Pepperwort	48
Phegopteris alpestris	71
dryopteris	99
phegopteris	129
Polypodium glycyorhiza	113
hesperium	113
Polypody	61, 113
Polystichum mohrioides var. *scopulinum*	123
Pteretis nodulosa	104
pennsylvanica	104
Pteris aquilina	125
Purple cliff-brake	105
Quillwort	32
Rattlesnake fern	59
Rock shield-fern	122
Rocky Mountain woodsia	133
Rusty woodsia	131
Scouring-rush	15
Dwarf	23
Northern	28
Smooth	18
Shield-fern	90
Sierra wood-fern	125
Slender cliff-brake	85
Slender lip fern	77
Smooth cliff-brake	105

	PAGE
Southern maidenhair	65
Spikemoss	140
Spiny wood-fern	92
Spleenwort	67
Maidenhair	67
Green	69
Struthiopteris filicastrum	104
spicant	76
Thelypteris dryopteris	99
Venus' hair	65
Wallace's selaginella	144
Water-fern	138
Western sword fern	121
Wood-fern	92
Woodwardia spinulosa	138

VICTORIA, B.C.
Printed by DON MCDIARMID, Printer to the Queen's Most Excellent Majesty
1956

2M-456-3199

HANDBOOK SERIES

of the

BRITISH COLUMBIA PROVINCIAL MUSEUM
DEPARTMENT OF EDUCATION
VICTORIA, B.C.

No. 1. Fifty Edible Plants of British Columbia.
George A. Hardy. 25 cents.

No. 2. The Amphibians of British Columbia.
G. Clifford Carl. 50 cents.

No. 3. The Reptiles of British Columbia.
G. Clifford Carl. 50 cents.

No. 4. Some Mushrooms and Other Fungi of British Columbia.
George A. Hardy. 25 cents.

No. 5. The Freshwater Fishes of British Columbia.
G. Clifford Carl and W. A. Clemens. 50 cents.

No. 6. The Birds of British Columbia: (1) The Woodpeckers; (2) The Crows and Their Allies.
C. J. Guiguet. 25 cents.

No. 7. The Earthworms of British Columbia.
E. E. Cornwall. 50 cents.

No. 8. The Birds of British Columbia: (3) The Shorebirds.
C. J. Guiguet. 25 cents.

No. 9. The Grasses of British Columbia.
William A. Hubbard. 50 cents.

No. 10. The Birds of British Columbia: (4) Upland Game Birds.
C. J. Guiguet. 25 cents.

No. 11. The Mammals of British Columbia.
Ian McT. Cowan and C. J. Guiguet. $1.

No. 12. The Ferns and Fern-allies.
E. M. C. Taylor. 50 cents.

Other publications of the Provincial Museum are:—

Annual Reports: Covering the activities of the Museum for each year.

Occasional Paper Series: Containing scientific papers in the fields of natural history and anthropology of the Province.

Anthropology in British Columbia Series: Reporting on activities in the field of anthropology for each year.

Special Publications: Containing material not included in the other series.

Copies of Museum publications may be obtained by applying to the Provincial Museum of Natural History and Anthropology, Victoria, B.C.